McGRAW-HILL DIGEST

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Silhouetted against the brilliant fireball of the atomic bomb exploded above the water in the Able Test are some of the ships of the target fleet. (Joint Army, Navy Task Force One photo)

Atom Bombs Sink Warships

Air burst at Bikini sinks 5, including 1 cruiser, wrecks 6. Underwater burst sinks 11, including 2 battleships, wrecks 5

Air Burst—"It is inescapable that this will be a provocation of ship redesign—particularly of upper structures." That was Navy Secretary Forrestal's reaction to the damage resulting from the mid-air burst of the Nagasaki-type atomic bomb (equivalent to 20,000 tons of TNT) in Test Able at Bikini. Although air bursts are not usually considered fatal to ships, the one atomic bomb sank 2 transports, 2 destroyers, 1 cruiser, wrecked 6 other ships, damaged 25, out of a total of 73.

Considering the material damage as distinct from the deadly effect of radioactivity on life aboard ship, here is what might be expected in terms of distance from the explosion: 1 mile, practically no damage; ¾ mile, slight damage; ½ mile, moderate damage; ¼ mile, heavy damage; between $\frac{3}{16}$ and ⅛ mile, sinking. There is little hull damage beyond ¼ mile. The heat from the bomb did nothing more than blister top paint coats and start a few fires in highly inflammable material. Final effects of radioactivity have not yet been reported. Of the animals on board, 10% died immediately, many more were expected to die later. Radioactivity in the atomic cloud did not affect the operation of drone planes.

Effects of the bomb on ship superstructure are indicated by damage to the cruiser U.S.S. *Pensacola* (10,000 tons), about ½ mile from the 400 to 600-ft.-high burst. The bomb's unbelievable jolt, a side punch delivered at an angle from the blast center, knocked her funnels down; left the after-deck a shambles; pounded the mid-deck into a concave saucer; stripped thick steel battle hatches and doors from hinges; and ripped loose superstructure plates. Capt. D. J. Ramsey estimated repair time at 4 to 6 mo. He believes that a crew sheltered below deck would have sur-

vived. The radiological action soon dissipated except in spots on the upper decks.

Significant trends in the future of military aviation were sharply defined at Operation Crossroads:

1. Complete obsolescence of the conventional airplane as a defense-offense weapon within 10 yr.

2. Replacement, in 5 yr., of today's bombers with, first, very long-range radio-controlled bombers and, second, very long-range manned bombers and fighters capable of launching guided missiles with atomic warheads.

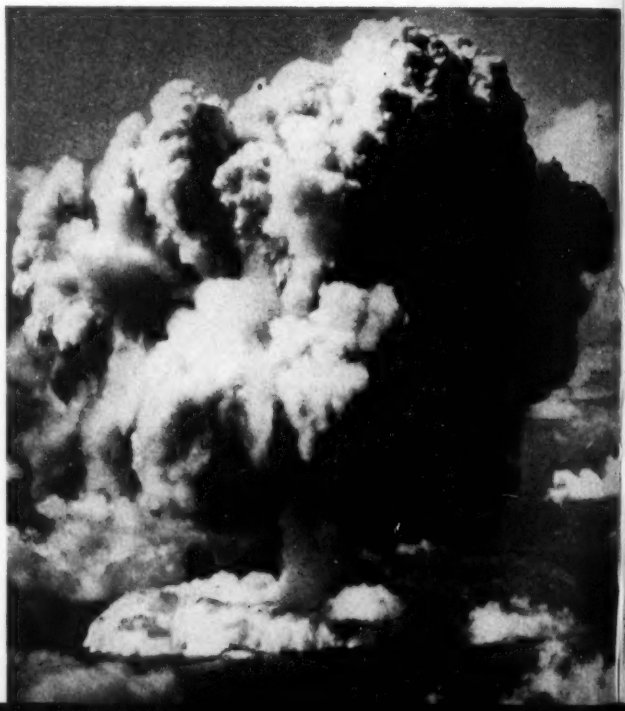
3. Greater emphasis on maintenance for bombers capable of striking anywhere in the world.

Under-water Explosion—In Test Baker, explosion of the atomic bomb under water (depth is secret) was followed by an appallingly sudden leap of a great column of water (500 ft. or more across) to 8,400 ft. and a rushing, rolling "front" of dense radioactive spray cloud that obliterated from view everything within a 5-mile circle. Solid masses of water soon fell back to the surface; the great clouds of droplets torn by the air from the rapidly uprising spout did not reach the surface for many minutes. As the spout fell back and water rushed in from the sides to fill the cavity in the lagoon, great waves started which presumably reached a height of 100 ft. 3,000 ft. from the blast and were 5 ft. high 3 miles away.

The visual blinding of a closely grouped fleet should place ships at the mercy of follow-up bombers. Presumably, the highly radioactive falling water would force deck gun crews to take cover. Confusion and personnel injury might cause some of the ships to ram others.

While full extent of the damage remained to be determined by detailed inspection, the bomb sank 11 ships including the battleships *Arkansas* and *Nagato* and the aircraft carrier *Saratoga*. Five more, including the battleship *New York*, were heavily damaged.

There remains no doubt that any ship directly over or under an atomic bomb will be destroyed, that if bunched a dozen would be destroyed.—*From special reports to all McGraw-Hill publications.*



Great column of water rises more than a mile as atomic bomb explodes at secret depth. (Press Association Photo)

Ways To Low-Cost Operation

Part III—Fifteen more easily applied ideas, each of which has helped some factory curtail operating costs

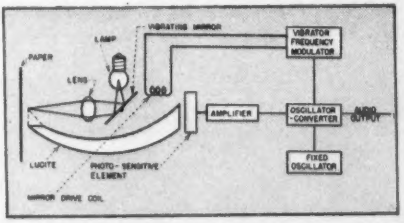
Materials Handling — A mirror manufacturer increased production nearly 60% and cut his working force almost in half when he installed steam-heated belt conveyors, so timed that chemical deposition is completed just as mirrors are transferred to a slat conveyor which carries them through rinsing, drying, and spraying operations . . . Ball-top pedestals in a shipbuilder's plate shop hold plates at working height and permit easy movement, yet allow operators to walk unhampered throughout the shop area . . . In one automobile factory, light overhead chain conveyors deliver work to, from, machine operators.

Salvage and Waste Control—A firm using metal stampings has cut its waste cost by making small, salable stampings, such as washers, from what normally would be scrap . . . A glove-maker turned waste into profitable knife cases, watch covers, change purses . . . An automobile manufacturer saved thousands of dollars a year by specifying the size and type of lumber to be used in packing cases of purchased goods, so that 100% of the "scrap" from the cases could be reused without trimming.

Industrial Power—A paper manufacturer reduced his monthly peak-demand power bill $200 by scheduling the start-up times for machinery so as to avoid the usual loads at the beginning of shifts and after lunch . . . A metal-working plant saved $850 a year by investing $1,500 in capacitors to increase the power factor . . . Instead of using feeder circuits, one large factory carries each motor circuit back to the substation switchboard where it is protected by its own breaker.

Quality Control—By daily administration of 30,000 units of vitamin A to each color-matcher, a large company reduced improper matching rejects from 1.7 to 0.3%, saved more than $5,000 a year . . . Moisture permeability of paper stock is tested by one company with a solvent that is absorbed the same as water, but 6 times as fast, saving 50 min. per test, eliminating production delays . . . One food manufacturer uses a photoelectric egg freshness tester which eliminates errors of human judgment.

Buildings and Services—Fiberized mastic sheet floor covering resists wear from daily scrubbing and rinsing in a syrup plant . . . One factory saved floor space, reduced down-time, by locating lavatory facilities in a specially constructed mezzanine, readily available to men in the working area . . . Transmission of moisture through a brick wall was stopped by spraying with a portland cement-water mixture (1 to 3) under 90 psi. air pressure. (See also McGraw-Hill Digest, June, p. 6; Aug., p. 6). —FACTORY



READING BY EAR—Printed letters are converted into distinctive sounds by an experimental RCA electronic device to enable the blind to read. A small spot of light is moved up and down along a vertical line by an electrically vibrated mirror behind a small lamp in a scanner little larger than a fountain pen. In synchronism with the light-spot motion, an audio oscillator is frequency-modulated so that frequency is high when the spot is at the top of the line, low at the bottom. Picked up by phototube, the reflected light operates an amplifier tube allowing the audio frequency to reach the ear only when the light spot is on black. The frequency of the tone heard depends upon the vertical position of the black area, and sound variations identify letters. —ELECTRONICS

NEW WEAPONS

A countermeasure missile capable of intercepting enemy guided missiles flying at supersonic speeds is one of several new developments announced by the U. S. Army Ordnance Dept. Others are:

Rocket Devices—(1) A 4,500-lb. rocket-assisted bomb which is being tested, along with a 22,000-lb. bomb, against submarine pens. (2) An automatic aircraft rocket launcher, only one of its kind in the world, capable of firing rockets at machine-gun speed. (3) A rocket-propelled "hydrabomb" that is launched from a low-flying airplane and travels underwater at 70 mph. (4) A research rocket that has traveled to an altitude of 230,000 ft., will reach 500,000 ft. (5) A 3,500-mph. guided missile fired at ships from the shore.

Metallic Jet—Fired by a 75-mm. shaped charge, a metallic jet produces a 25,000-fps. blast of disintegrated metal capable of penetrating 4-in. armor plate and can be installed in a guided-missile warhead.

Flying Tank—Airborne to the combat theater, a new tank glides to earth with its engine running and the crew ready for action.

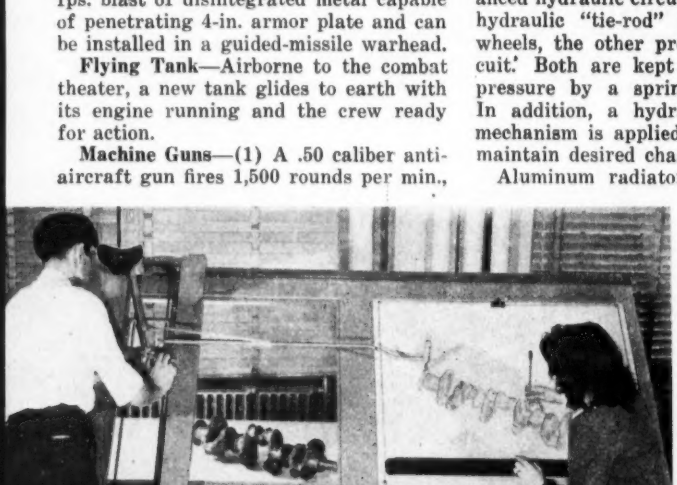
Machine Guns—(1) A .50 caliber anti-aircraft gun fires 1,500 rounds per min., is expected to fire 5,000 eventually. Research aims at 30,000. (2) A .60 caliber aircraft machine gun that has the highest velocity up to 600 yd. of any weapon developed by any nation.—AVIATION NEWS

COMING IN AUTOS

Small, light, 5-passenger automobiles with rubber torsion springs, independent wheel suspension, and hydraulic steering are 1950 possibilities discussed at the recent meeting of Society of Automotive Engineers. Rubber torsion springs consist of rubber cylinders bonded internally to a central shaft and externally to an outer shell, one member being held stationary, the other rotated by the wheel-support arm. The proposed front suspension utilizes single-wheel support arms mounted on the outer member of the rubber springs.

Hydraulic steering consists of 2 balanced hydraulic circuits. One serves as a hydraulic "tie-rod" between the front wheels, the other provides a pump circuit. Both are kept under a minimum pressure by a spring-loaded reservoir. In addition, a hydraulic constant-level mechanism is applied to all 4 wheels to maintain desired chassis height.

Aluminum radiators, furnace brazed,



QUICK SKETCHES — Complicated drawings that ordinarily require days are made in a few hours with the robot "Sun-Vu" pencil used by Studebaker. As an operator follows the object with a sighting instrument, he presses a button at salient points. This operates an electrically actuated pencil on an arm extending from the sight. The dots thus made on the drawing paper are joined by hand and shaded.—BUSINESS WEEK

have won Army approval, and vibration tests with supercharger intercoolers revealed resistance to disintegration more than twice that of soldered copper.

Bearing metals containing small amounts of tin, nickel, and copper, with the remainder commercially pure aluminum, were said to give better service under extreme loads at high temperatures. These bearings are credited with resistance to organic acids released by lubricating oils, and with ability to absorb particles of bronze and steel. Silicon is reported to improve the antifrictional and antiscoring properties of the new material. Under boundary and thin-film lubrication conditions, the bearings may accommodate much greater loads than bearings of babbitt, bronze, and copper-lead. —BUSINESS WEEK

GERMAN TEXTILE TECHNIQUES

During the war, the Germans employed the paste-dispersion method for polyvinyl chloride-coated fabrics and films. The resin, plasticizer, and pigments were mixed together, applied as a paste containing 100% solids, then fused under high heat to produce a tough, flexible film widely utilized for upholstery and shoe soles. Light coatings weighed 2 oz. per sq. yd.

Emulsion coatings of polyvinyl acetate were used extensively as a substitute for oil cloth, for shoe inner-soles and linings. Polyisobutylene was used as a coating for gasproof clothing. —TEXTILE WORLD

BUSINESS ON IMPULSE

Impulse purchases accounted for 38% of purchases in U. S. supermarkets last year, 25% in 1944, a du Pont Cellophane Division survey shows. This type of buying is most noticeable in candy, cakes, cookies, dehydrated foods, jams, jellies, relishes, spreads, macaroni, spaghetti, dessert mixes, cheese, frozen foods, crackers, pretzels, and potato chips. Open displays and better packaging presumably are responsible for this trend in buying. —BUSINESS WEEK

ROUND HOUSE—A spherical, concrete-and-welded-steel, 3-story dwelling, providing 2,000 sq. ft. of floor space, is to sell for $7,000. By a patented design, the steel ribs are constructed around a large metal cylinder which carries a forced air gas heating and air conditioning unit and acts as a chimney. The flattened roof will be a glassed-in solarium. —ENGRG. NEWS-RECORD

BREAD BAKED IN STEAM

Developed by the Germans during the war, a novel method of baking rye bread makes it mold-resistant and is claimed to save 30 to 50% on fuel. The rye bread is baked in an oven placed inside a steam boiler. Steam at 103° C. is allowed access to the inner oven. The bread is then cooled, sliced, wrapped, and sterilized in an ordinary oven. The bread has no crust. To prevent rye dough from sticking to baking tins, sawdust was used as a dusting material in several of the German bakeries. —FOOD INDUSTRIES

MOLYBDENUM IN MANCHURIA

Located 40 mi. from the Gulf of Liaotung, a reported molybdenum mine is said to have produced 400,000 tons of ore per year under Japanese direction. Reserves are estimated by them to be 8,000,000 tons. Present production, 600 tons a month. —ENGRG. & MINING JOURNAL

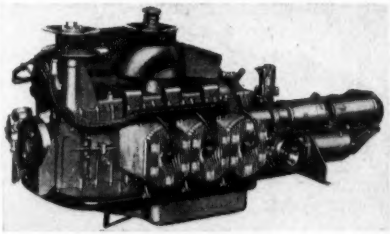
Engine of Radical Design

Built-up crankshaft, solid connecting rods, die-cast crankcases, sleeve valves, and ingenious pressure seals and temperature control are features

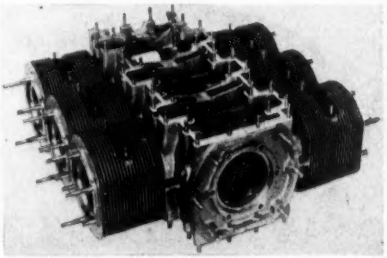
By radical design of its new horizontal, opposed-cylinder, aircooled automotive-aircraft gasoline engine, Jack & Heintz Precision Industries, Inc., claims to have attained high specific hp. and speed, low weight, a comparatively flat torque curve, and good fuel economy.

A 6-cyl., 3¼ x 2⅝-in. (126 cu. in.) automotive model for rear-end mounting develops 95 hp. at 6,000 rpm., weighs 200 lb. Size variations in 2-cyl. steps are easy, because end casting, valves, valve gear, and cylinder assemblies are interchangeable and the crankshaft is of built-up construction lengthwise. Die-cast aluminum-alloy crankcase halves each carry half of the cylinders, are doweled and bolted together. Cylinders have integrally cast cooling fins, and stud and bolt holes are cast in. The only machining is milling crankcase top, bottom, ends, and cylinder heads, and, after assembly, boring cylinders and main-bearing housings. Rosan studs and threaded bushings are used throughout. Cylinder-head studs have coarse threads, are locked in by a ring pressed into the aluminum boss after stud is screwed in. A half section for a 6-cyl. engine weighs 28 lb., is formed in a 1,000-ton die-caster that weighs 75 tons, has 14-ton dies.

Cylinders are centrifugally cast and honed Ni-Resist steel which matches piston and block expansion. They are fastened to crankcase by a positioning piece and shoulder so they can expand and contract. Forged and form-ground aluminum-alloy pistons and main-bearing blocks make up the 6-cyl. crankshaft assembly illustrated. Crankcase halves are slipped over it. Sketches show: how crankshaft is built up; the main bearing with its solid, hardened-steel, honed bushing die-cast in the housing and the 0.58-lb. solid connecting rod. Hardened steel rod and bearing surfaces run on anti-friction bearing metal on crankshaft journals.



Automotive model with cooling fan on top and designed for rear-end mounting.



Assembly of 2 crankcase-cylinder sections, each formed on a 1000-ton die-caster.

The valve-gear assembly is mounted on a quarter-speed eccentric shaft, each eccentric unit reciprocating two of the 0.040-in. thick Nitralloy "G" or "H" valve sleeves. The shafts run directly on their magnesium die-casting supports.

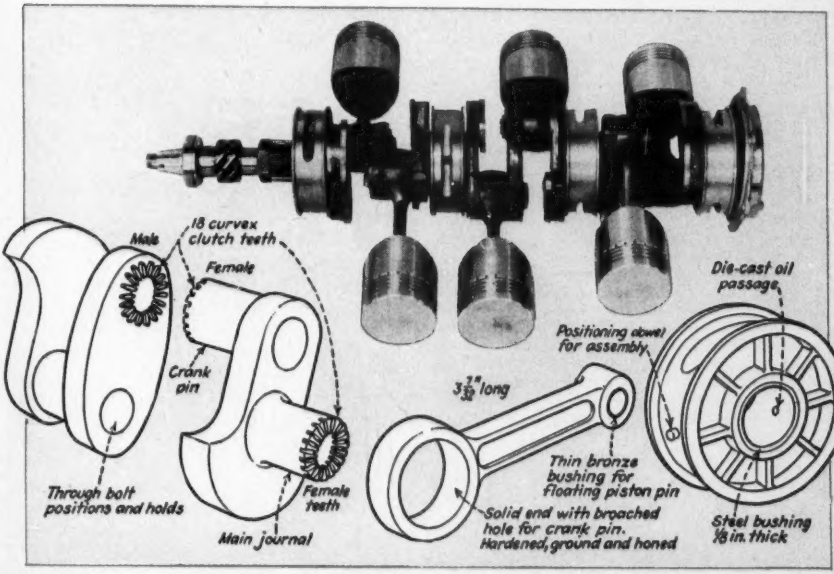
End sealing of the valve port ring at the head end of the cylinder is ingenious. There is a floating sealing ring above the port ring which bears against a Belleville washer which imposes a predetermined static load on the assembly when the cylinder head is in position. A bevel section on the inside of this sleeve divides

the cylinder pressure into a radial and an axial force. The latter adds to the static load and presses the port ring against the end of the cylinder sleeve to load the two chrome-plated surfaces in proportion to cylinder pressure.

Sealing the floating sleeve at the head end is another feature. A tapered laminated spring-steel cone is clamped in the cylinder head. Two-thirds of the inside area of this cone is exposed to combustion-chamber pressure. As a result, the laminated packing expands in proportion to the internal pressure and prevents leakage past the floating seal ring.

Constructing the crank shaft in units with 18-tooth ends permits throws to be set at right angles or at 120° when 2-, 4-, or 6-cyl. units are assembled. It also allows different end assemblies to be used: a reduction gear at the front and an accessory drive at the rear when an aircraft engine is assembled, or a crank and dampener extension at the front and a flanged journal at the rear to take a flywheel in an automotive installation.

Interesting, also, is the control of engine temperature. An axial-flow fan above the cylinders on the automotive engine is driven by a horizontal V-belt. The driving pulley has a slidably mounted side so effective diameter can be varied and speed of the fan changed. The sheave at the fan is spring-loaded; changes in fan speed ratio are accomplished by a hydraulic servo actuated by engine oil pressure. Engine tests indicated that variations in absolute manifold pressure were practically a straight-line function of the variations in hp. This principle was utilized, together with an ambient-temperature compensator, to provide control for the hydraulic servo mechanism. —AMERICAN MACHINIST



Forged and form-ground aluminum-alloy pistons, solid connecting rods, built-up crankshaft, and main bearing blocks make up the 6-cyl. crankshaft assembly. Crankcase-cylinder halves are slipped over it.

RADICAL DESIGN FOR LIGHT PLANE

Now under construction, the Rohr Aircraft M.O.-1 495-lb., personal, all-metal airplane has a conical forward boom supporting the elevator, an egg-shaped crew nacelle, and a buried power plant driving a pusher-propeller. The swept-back, laminar-flow wing has fixed plates at tips for directional stabilty. Control surfaces are moved by pressurized air routed through ducts in wing panels and fuselage to bellows-type flap panels. Reduced drag and improved airflow to propeller are said to be attained by a system of fuselage boundary layer control in which engine cooling air is taken in through a circumferential slot.

The new control system consists of full-span slots at the 80% chord point with a constant flow of pressurized air into the boundary layer. Rotation of the wheel to the left, for example, partially closes a flapper valve in the air duct leading to the left wing. This stops the flow of boundary layer air, lowering wing's lift and moving center-of-pressure forward. Simultaneously, the right-wing lift is increased and the center-of-pressure moved aft, both accompanied by a differential jet effect of the boundary layer slot which provides the yawing moment to turn the plane. Longitudinal control is provided by a swept-forward surface in the nose, the elevator portion of which is also provided with a full-span pressure-slot device.

Boundary-layer control permits maintenance of lateral control at the maximum lift coefficient, produces favorable yawing moments, permits development of theoretical maximum lift coefficient of the airfoil in flight, permits higher lift at lower angles of attack, and sharply reduces profile drag. —AVIATION NEWS

BAKERS' CHEESE FROM SKIM MILK POWDER

Spray-process skim milk powder can now be used to produce bakers' cheese, and offers economies in transportation, storage, and freezing. The dried skim milk is reconstituted to produce higher solid content than normal milk. Good lactic starter and a small amount of rennet are added. When the curd is firmly coagulated (4-16 hr.) it is placed in muslin bags (without being heated or cut) until most of the whey has drained off.

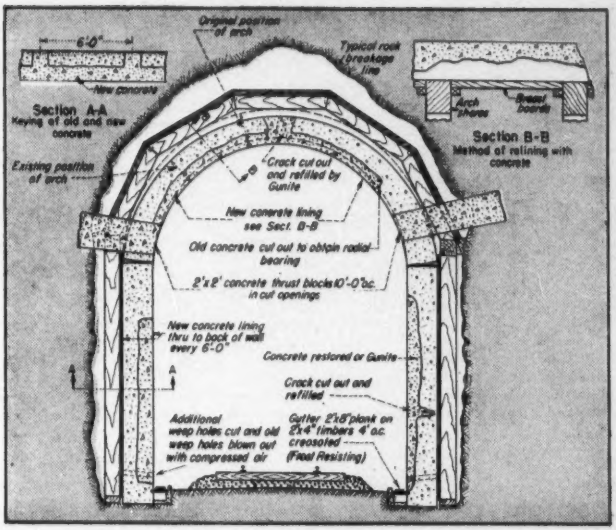
It is then ready for marketing. Yield varies from 1¾ to 2¼ lb. per pound of powder, depending on texture of cheese desired. —FOOD INDUSTRIES

CHROME-PLATED PISTON RINGS IMPROVE ENGINES

Further results of the chrome-plating of piston rings by Koppers Co., Inc., show that wear on cylinders and piston rings is greatly reduced. Placed in high-output aircraft engines, the porous chrome piston rings increased, by 5 times, the flying hours between engine overhauls. Tested in all types of bus-engine cylinders, the plated rings maintained their peak efficiency over longer periods, effected as much as 44% improvement in miles per gal. of lubricating oil and 2.7% in miles per gal. of fuel. Average ring

CONDUIT FLOATS TO LOCATION—Made of 2-in.-thick Spanish cedar staves, this 250-ft. sewer pipe in Paraguay was built on greased ways, then pulled into the river by truck-powered tackle, and floated to location. Concrete counterweight, attached by its reinforcing bars to the hoops of the pipe, caused it to sink into a prepared trench. To resist quarry stone then laid over top, 4-in. wooden flanges were spaced every 8 ft. —ENGRG. NEWS-RECORD

CHEAPER TUNNEL REPAIR — In single-track railroad tunnels, reconstruction has been cheapened from $300 to $100 per lin. ft. Thrust blocks cast in holes cut through concrete lining will furnish springline support for arch. Walls of brick pilasters and timber breast boards, or continuous brick walls, can replace old walls if clearances permit, or new concrete facing can be applied. Wing walls serve as buttresses for head wall. Tangential arrangement of brick in arch gives maximum flexural strength. —ENGRG. NEWS-RECORD


Original position of arch
6'-0"
New concrete
Typical rock breakage line
Section A-A
Keying of old and new concrete
Existing position of arch
Arch shores
Breast boards
Section B-B
Method of relining with concrete
Crack cut out and refilled by Gunite
New concrete lining see Sect. B-B
Old concrete cut out to obtain radial bearing
2'x2' concrete thrust blocks 10'-0" c.c. in cut openings
New concrete lining thru to back of wall every 6'-0"
Concrete restored or Gunite
Crack cut out and refilled
Additional weep holes cut and old weep holes blown out with compressed air
Gutter 2'x8" plank on 2"x4" timbers 4' o.c. creosoted
(Frost Resisting)

wall wear per 1,000 miles was 0.00038 in.

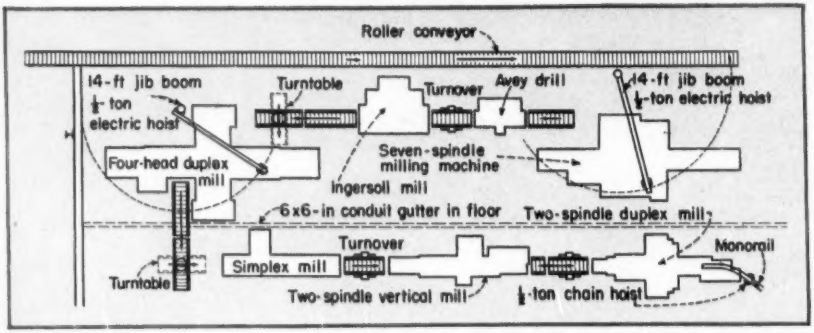
The chrome, of extremely fine porosity, first holds the lubricating oil in the ring surface. As the porosity begins to wear off, which takes but a few minutes, the tiny particles mix with the oil, acting as a gentle hone to polish the cylinder, and cause the rings to seat-in almost immediately. This quick and perfect seal reduces blowby and cuts down the break-in erosion, corrosion, and high temperatures. —BUS TRANSPORTATION

LONGEST CABLEWAY FOR ORE

In Swedish Lapland, pyrites and zinc deposits were found scattered through a roadless waste region of morasses and steep mountains. To transport the ore 60 miles to bins and railroad cars, the longest wire-rope aerial tramway in world was built at a rate of 5 miles per month, despite severe winter. Locked-coil type cables and ropes are mounted on 514 concrete columns 8 to 125 ft. high. Cable tightening is done at 25 stations, and tension is maintained by 30-ton concrete weights. Eight 135-hp. variable-speed motors furnish power. Operation is automatic at the 10 driving and loading-unloading stations. Annual capacity, with 915 covered buckets, is 300,000 tons. Transport cost will be ¼ of that with trucks. —ENGRG. & MINING JOURNAL

SPECIAL-PURPOSE MAGNETS

For small, lightweight magnets of intricate shape, General Electric now makes 5 permanent-magnet materials: (1) Cunico, a copper-nickel-cobalt alloy which is malleable, ductile, and machinable, but is age-hardened in manufacture. (2) Cunife, a copper-nickel-iron alloy with the physical properties of Cunico but with directional properties. (3) Vectolite, a hardened, sintered combination of iron and cobalt oxide which is nonconductive, highly resistant to demagnetizing forces. (4) Alnico 12, a combination of aluminum, nickel, cobalt, iron, and titanium, cast and ground to shape. (5) Silmanal, a ductile and malleable material having a high coercive force.—PRODUCT ENGRG.



EFFORTLESS HANDLING—In the Buda diesel cylinder block production line, the main roller conveyor is supplemented by an unusual assortment of turntables, turnovers, slide carriages, and air lifts to reduce operator effort, cut costs, contribute to quality workmanship. The layout features constant level of operations. Hoists are used only when top-loading into machine is required. Equipped with rollers on top and bottom sides, the pivoted turnovers are counterbalanced so that 1 man can handle a 900-lb. diesel engine casting. —FACTORY

BABY BEARINGS WORTH 4 × WEIGHT IN GOLD

Designed for ball-bearing fountain pens but useful in delicate instrument bearings, 1-mm. precision steel balls (7,000 weigh 1 oz.) are mass-produced by SKF Industries and sell at 2¢ each ($140 per oz. against $35 for gold).

Modified large-bearing machines cold-press the ball blanks from 0.045-in. high-carbon and chromium wire at 18,000 an hr. Grinding before and after heat treating reduces size to 0.039 in. Half a million balls are produced in 190 machine-hours. —BUSINESS WEEK

NEW TEXTILE TECHNIQUE

Mean fiber length is a better and more consistent indicator of potential yarn strength than classified length. To eliminate all unnecessary measuring, weighing, and computing, a new fiber-array technique involves laying down array so uniform along its entire length that any 2 sections will contain approximately the same number of fibers. All length values can be read directly from the chart of this array. The small pinches taken from the bale of fibers should be well combed and mixed before arraying and conditioning to standard humidity. Stretch, breakage, and masking of short by long fibers must be avoided. Such an array can confirm or correct a classer's measurement, and can indicate needed machine adjustments. —TEXTILE WORLD

NEW FOOD-PACKAGING

Designed for fully automatic weighing, filling and shaking of ground coffee into 1-lb. cans at 60 per min., a machine of Triangle Package Machinery Co. passes the coffee from a hopper into 2 vibrated trays, one for bulk feed, the other for finishing feed. These discharge into weighing receptacles, then into the cans.

Nonoxidizing, odorless ink, composed of pigment, synthetic resin and an odorless organic solvent is being offered by General Printing Ink Co. When the resin, dissolved in a mixture of the solvent and a small amount of water, is exposed to the moisture in the air, it hardens to a thin film, preventing offset.

Giving protection against moisture loss, moisture pickup and insect infestation, a Pliofilm-lined flexible package for dried raisins is being produced by Vagin Packing Co. —FOOD INDUSTRIES

Fault Finders for Industry

X-rays, gamma rays, supersonic waves, magnetic particles and penetrants, and new spectograph technique find faulty materials, parts

Manufacturing costs are being reduced by peacetime applications of wartime developments and improvements in nondestructive testing of materials and parts. In one case, machining costs were cut 40% by sorting out defective pieces before machining. And it is estimated that up to 80% of castings, forgings, and diecastings in aluminum and magnesium, which might be scrapped for flaws revealed by visual inspection, can be salvaged by judicious use of x-ray testing. The nondestructive methods, which supplement each other, are:

Radiographic—X-ray equipment, now shockproof, includes: (1) lead-lined cabinet-type machines rated at 250,000 volts; (2) equipment rated at 2,000,000 volts, designed for medium-size objects, and installed in a special room to protect outside personnel; (3) mobile units rated as high as 400,000 volts, for x-raying large, heavy assemblies at the building or erection site. In many instances, feed tables using dollies or platens, roller conveyors, conveyor loops, or conveyor-type turntables move parts through the cabinet machines.

Fluoroscopic Tests—While the definition of the shadow image on an x-ray-excited fluorescent screen is not as sharp as with x-ray film, this type of inspection permits the object to be turned at will or to pass along a conveyor at rapid viewing speeds. Its major use is with light alloys, diecastings, plastics, and sealed assembled mechanisms. A new machine will have a 70-mm. camera to record the images for examination at leisure.

Diffraction Method—X-ray diffraction has been found of importance in routine inspection. When an x-ray beam is passed through a crystal of a substance, the rays are "bent" into a pattern characteristic of the material.

Supersonic Inspection—X-rays penetrate only about 12 in. of steel. To find flaws at greater depth, as in heavy axles, a supersonic sound beam, electronically generated, is directed into the part. The reflections from the back face of the part or from flaws are reproduced on an oscilloscope screen, and the instrument indicates the depth (as great as 28 ft.) of a flaw below the surface.

Magnetic-particle Inspection—Magnetic-particle and fluorescent-penetrant methods have been highly developed for finding nonvisible cracks, inclusions, and pores, at or near the surface of a finished or semifinished part. In the first

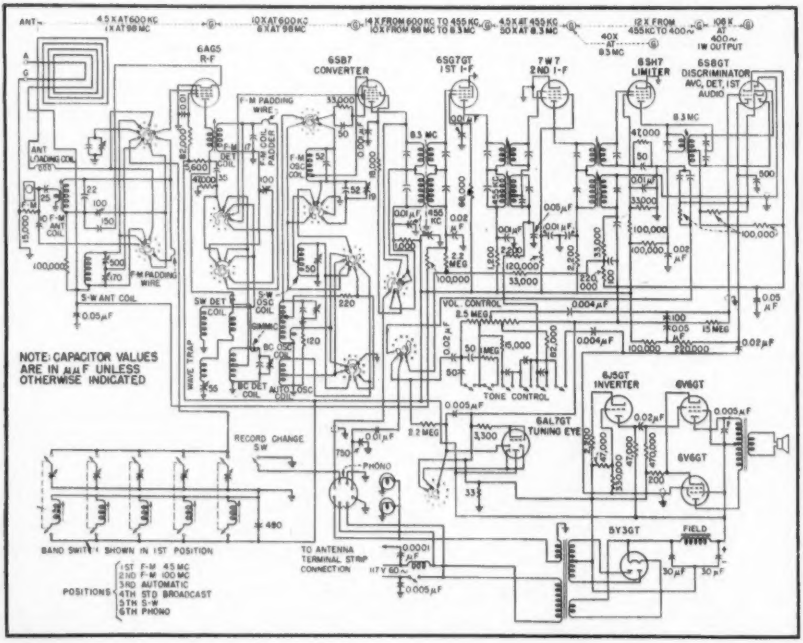
Supersonic flaw detection is particularly suitable for pieces of great depth—or extremely thin layers.

method, the object is magnetized and fine magnetic particles are dusted over it, or flowed on in solution. Build-up of the particles reveals a defect. Magnetic particles with fluorescent additions make it easier to find flaws in complicated pieces like gears and splines.

The penetrant process is for materials that can't be magnetized.

Magnetic Analysis—When a bar or tube of "raw stock" is passed through a magnetic head, a defect is shown by a change in the electrical characteristics of the equipment, indicated on a meter or oscilloscope. Though a less critical method than magnetic-particle inspection, this technique detects flaws in ferrous or nonferrous metal at speeds of 100-120 ft. per min. In a variation of this method—a standard part in one electrical coil, the production piece in a second coil—machine parts can be inspected for faulty heat-treatment.

Spectrographic Inspection—"Flat surface sparking" is a recent development in spectographic analysis of the exact composition of castings, forgings, and bar stock. A small flat spot on the object is used as one electrode, and the spark is caused to jumped to another electrode. The spectrum of the burning metal is film recorded. —BUSINESS WEEK



MODERN RADIO RECEIVER—To satisfy the widest demand, a complete home radio receiver must have standard broadcast and shortwave a-m bands, 2 f-m bands, and automatic tuning. The major problem is development of an 88 to 108-mc. frequency-modulated circuit providing maximum performance at minimum price. The circuit must be so designed that conventional a-m sections can be added economically. One solution is represented by the above schematic circuit of a complete receiver. The f-m design is based on a limiter tube combined with a balanced discriminator or phase detector. This design has had the most field experience. —ELECTRONICS

METAL DUST COLLECTION PAYS WAY IN ENGINE PLANT

Dust collectors remove as much as 2 tons of cast iron each working day from the air in a General Motors' plant which builds 100 to 200 diesel engines daily. Each metal-working machine is equipped with a specially designed hood—strength of vacuum is not nearly as important as hood design and placing. The most successful hoods are small and mounted as close to the cutting edges as possible; larger particles are collected in convenient pans as they fall off the screens. The suction pressure at the hoods is 6 to 9 in. of water. Dust-laden air is sifted through canvas in a Pangborn unit on the roof. During lunch hours, a special agitator shakes the dust onto a 600-ft. conveyor leading to railroad cars.

Dust brings $13 a ton to pay cost of operation. And if dust were not collected, it would blacken walls, windows, and lights, find its way into bearings, and lungs of workers. —AMERICAN MACHINIST

NICKEL-PLATED PROPELLER

Now under development, a nickel-plated propeller may be one of the year's outstanding aviation achievements. It should cost no more than a wood propeller, yet have twice the life and be virtually free of maintenance problems. The nickel coating, of accurately controlled thickness (perhaps 0.010 in.), is electroplated onto a preformed blade of wood, laminates, aluminum, magnesium, or other lightweight material. Extra thickness can be applied to the propeller's leading edge. —AVIATION NEWS

WHARF REBUILT IN SERVICE

An old, weak wharf in San Diego was rebuilt and enlarged without service interruption. Piles were driven through holes cut in the old wharf. Decking was removed on half, the old piers pulled up by a barge-crane, and new deck laid. This half was then used while remainder was rebuilt. —CONSTRUCTION METHODS

SHOPPING WITH A KEY—A demonstration unit of the improved Saunders Keedoozle, first tried in 1939-40, has been built by Automatic Electric Co. With this automatic shopping system, the customer inserts a key into a slot under the display of each item she wishes to buy. Name and price of the item is automatically printed on paper tape inclosed in the key, and a series of holes is punched in the tape. The tape is then run through a tabulator, and the holes actuate a stock-room mechanism which drops the listed articles onto a conveyor belt that carries the entire order to the cashier, together with the totaled bill. Capacity is 300 articles per min. —BUSINESS WEEK

BETTER PASTEURIZATION TEST

An improved, rapid, precise phosphatase test will detect 1 lb. of raw milk in 2,000 lb. of properly pasteurized milk, and can be modified to determine whether the milk used in making cheese has been pasteurized. The process depends on the presence or absence of an enzyme. The enzyme is inactivated at a temperature only a few degrees higher than that necessary to render harmless the most resistant pathogenic organisms. Therefore a negative test indicates the adequacy of pasteurization. Since phosphatases are constituents of many foods, the test has wide applications in processing. —FOOD INDUSTRIES

POWER PLANT OVERCOMES WOODWASTE FUEL TROUBLES

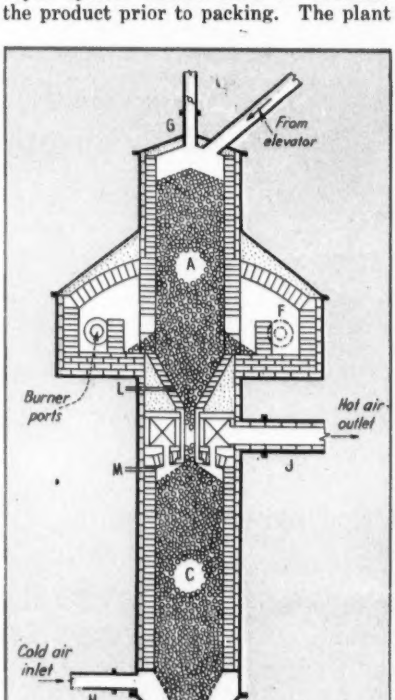
Woodwaste with a 50% water content is burned in the boilers of Weyerhaeuser Timber Co., and problems were introduced by the salt deposits from the waters of Puget Sound and by cinder particles in the discharged gas. Because of specially designed water walls, release of salt in the furnace proper presents no problem, but the salt does carry into the nest of the superheater tubes. Here an air lance, applied every day, removes the deposits, which ordinarily withstand the action of a sootblower. Additional furnace maintenance consists of building up the exposed area of the grate surface by arc-welding about once in 3 years, the grates being straightened in plate rolls.

Water-spray collectors do not satisfactorily remove the 1 gr. per cu. ft. of cinders in the flue gas, so mild steel is arc-welded onto the blade facings to withstand the abrasion. Even better results appear possible with cast iron similarly applied. Heavy process-steam demands result in use of much make-up water, which contains a total solids content of 34 ppm. Silica scale on the condensing turbine blades is being removed relatively easily by washing with a caustic-solution. —POWER

BACTERICIDAL LAMPS TO BE BIG BUSINESS

Based on minimum protection for personnel and products, the estimated need and market for ultraviolet bactericidal lamps totals over 4 million for hospitals, over 4 million for schools, 420 thousand in offices of doctors and dentists, and a complete total—including units in theaters, hotels, offices, stores, plants, and homes—of over 125 million.

In a plant manufacturing a medicinal ointment, the bactericidal lamps have prevented contamination by air-borne bacteria, viruses, and spores of mold and fungi. Air in constant circulation is carried past the units often enough to accomplish the equivalent of 10 complete air changes per hour. A hooded conveyor system houses units to irradiate the product prior to packing. The plant



PEBBLE HEAT EXCHANGER—Characterized by high thermal efficiency and low initial cost, a new pebble heater overcomes basic limitations of commonly used heat transfer units. It employs a continuously recirculating bed of refractory pellets which are heated by high temperature gases (combustion products) and then give up their heat to a cold gas passing through the bed. Pebbles are kaolin, mullite, or an aluminum oxide composition, fired in a special shaft kiln. The applications so far are: preheating air for combustion, heating steam for process operations, heating reducing gases, and in the field of refractories. —CHEM. & MET. ENGRG.

personnel have lost an absolute minimum of time as a result of respiratory infections. The system has proved extremely economical. —ELECTRICAL WHOLESALING

NEW FOOD PRODUCTS

Two new quick-frozen food products are now on the market. Pineapple, frozen in 60° Brix sirup, is offered in 1-lb. wax-coated cartons by Pan-Am Freezers. Chicken a la king, in 12-oz. wax-coated packages, is produced by College Inn Food Products Co.

Used recently by hotels and restaurants, a new batter mix, consisting of bleached wheat flour, baking powder, salt and pepper, powdered egg, powdered skim milk and certified food color, is being distributed in retail containers by Palmer House Food Products Co. Mixed with equal parts of water, the batter is suitable for deep frying sea food, meats and vegetables. —FOOD INDUSTRIES

BILLION HITS FOR DIES?

Cemented carbide dies have punched 2,000,000 razor blades from 0.004-in.-thick, 0.882-in.-wide, 1.10% carbon strip steel with no signs of wear and only a 0.002-in. burr on the blades. A high-carbon, high-chromium tool-steel die must be redressed after 100,000 to 125,000 hits. Twenty million hits between sharpenings and a life of 1 billion hits is seen possible for the carbide dies, offsetting their high cost. —AMERICAN MACHINIST

PAYMASTER'S AID

In cases where spinners are paid by the side, a payroll-constant chart will aid in wage calculations. Rates applied to side spinning are generally determined on a job basis. The total sides of the job are divided into the weekly wages to obtain a weekly rate per side, and this rate becomes standard for a given yarn count. If the rate per side on a 40-hr. basis is $2.50, and the working hours are changed to 48, the basic rate does not change, but the payroll constant will rise proportionately. —TEXTILE WORLD

NEW PLANES FOR NEW FEEDER LINES

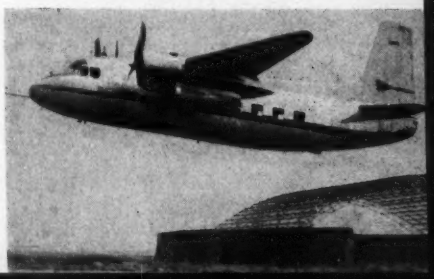
U. S. aircraft manufacturers are bringing out several planes with high operating efficiency for service on the newly developed short lines feeding passengers and cargo to the long, established trunk lines. The $130,000 Lockheed *Saturn* has 14 quickly removable seats, weighs 16,000 lb. gross, cruises at 200 mhp. on two 600-hp. Continental or 800-hp. Wright-engines. Exceptional efficiency comes from its laminar-flow wings, light-weight aluminum alloy structure, and utilization of the jet effect of the engine exhaust.

In the 20-24-passenger class, the new Boeing 417 has a full-size truck-bed-height rear cargo door for easy freight handling. It is powered by two 800-hp. Wright engines and, like the *Saturn*, is a high-wing monoplane providing passengers with relatively unobstructed view and putting the cargo hold close to the ground for loading and unloading.

The Beech 18-C carries 6-10 passengers, weighs 9,000 lb., has two 500-hp. Continental engines.

Hughes Aircraft has designed an 18-passenger, 18,500-lb. gross feeder liner using two 825-hp. Pratt & Whitney Wasp engines. Southern Aircraft has a small feeder prototype of its 6-place executive transport, and Aero Design & Engineering soon will test a new 7-passenger plane. The Grumman *Mallard*, a new flying boat for executive transport, also has feeder line use. —BUSINESS WEEK

The "Saturn," one of the new aircraft especially developed for feeder service.



TECHNICAL SHORTS

Jet-tail Helicopter—In place of the usual torque-correcting rotor at the tail, a British helicopter utilizes jet thrust from an orifice in the tail. The exhaust from the 330-hp. engine driving the rotor is expelled through the jet. —AVIATION NEWS

Faster Floor Repair—To remove worn floor covering in transportation vehicles, a bank of 12 standard 375-watt infrared bulbs mounted face down on the underside of a low metal platform will supply the heat necessary to loosen the cement holding covering to plywood or other flooring.—BUS TRANSPORTATION

Air Deflects Debris—Compressed air, forced through an installation of metal pipes extending from the tops of lock walls at quoin castings or "heels" of the gates down to 20 ft. from the chamber floor, creates a surface current forcing logs and debris away from the gates and out of the chambers. In large locks 6 cost $1,000. —ENGRG. NEWS-RECORD

Safe Cleaning—For handling clean and waste oleum in spray cleaning booths at airports, two 5-gallon cans are strapped together and stencilled "clean" and "waste". The clean can is filled and the pair set under the booth so the drain discharges into the waste can. Overflows are impossible, open pails eliminated, fire hazard minimized.—AIR TRANSPORT

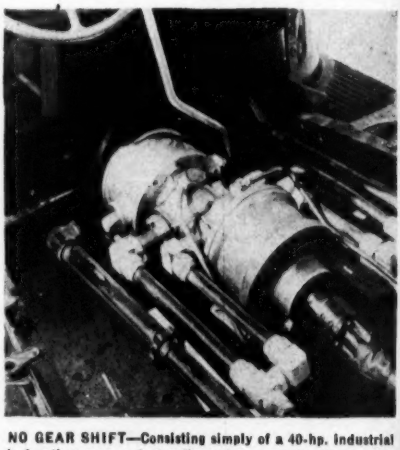
Yoke Pulls Piles—Concrete piles 18 in. square and up to 95 ft. long were pulled from San Francisco Bay mud by a special yoke attached to a heavy A-frame floating on an outriggered barge. Made of steel plates, the yoke, slipped down over top of pile, transmitted the pull to the pile by steel toggle jaws on two sides, so designed that as pull increased, grip increased. Stainless steel rods welded in ridges to jaw faces improved the grip. A total of 36 piles were pulled by this yoke in an 8-hr. shift. —CONSTRUCTION METHODS

Scale Prevention—To prevent the formation of scale in bottle-washing machines, chemical compounds that hold the salts in solution are available. Sodium hexametaphosphate, tetrasodium pyrophosphate and sodium tetraphosphate are three such products. Scale-prevention materials may be added to the soaker tank along with the daily upkeep charge; by a drip can connected with the rinse tank; or by a simple positive displacement pump that can be attached to any reciprocating part of the washer. —FOOD INDUSTRIES

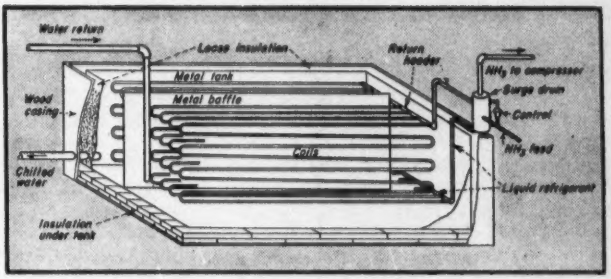
Peroxide engine—Certain types of German submarines, powered by Walter gas turbine, carried hydrogen peroxide which, subjected to a cracking agent, gave off heat. Fuel oil fed into the hot mix resulted in gases expanding to drive the turbine. Underwater speed of 25 knots was claimed, but no such sub got into action. —SCIENCE ILLUSTRATED

Better Cable Sheath—A lead alloy containing arsenic (0.15%), tin (0.10%), and bismuth (0.10%) extrudes and ages well, promises life free from most troubles encountered with other lead compositions.—ELECTRICAL WORLD

Reduces Mine Car Wear—A retractable hinged dumping ramp, designed by Howe Sound Co. eliminates the second, and unnecessary, dumping of mine cars. Overhead cable connects the ramp with the door of the opposite ore pocket, and when the ramp is folded back by a 4-in. compressed air cylinder controlled by the locomotive operator, ore-pocket door closes. —ENGRG. & MINING JOURNAL



NO GEAR SHIFT—Consisting simply of a 40-hp. industrial hydraulic pump, a hydraulic motor, a small oil reservoir, and an oil-cooling radiator, this demonstration installation on a small passenger car eliminates the transmission, clutch, and gear shift. If a hydraulic motor were mounted on each rear wheel, drive would be direct and the propeller shaft, universal joints, and differential would be unnecessary. —BUS TRANSPORTATION



ICE BANK—When chilled water is used for cooling food products, refrigeration can be stored at night in an ice bank. This permits use of smaller compressors than direct-expansion cooling requires and offers insurance against breakdown and power failures. —FOOD INDUSTRIES

Heat Helps Tighten Bolts—An electric resistance heater inserted in a large, hollow bolt expands the bolt when the nut is screwed on, gives a tight fit as the bolt shrinks upon cooling. —BUSINESS WEEK

Electronics for Prunes—Instead of being externally heated, prunes, boiled from 5 to 15 min., are now being packaged, then passed through a high frequency dielectric field, by Clara-Val Packing Co. —FOOD INDUSTRIES

"New" Engines for Old—Continental Motors will exchange a factory-rebuilt aircraft engine with a new-engine guarantee for a used engine and $247.50 to $288, depending on the model. Accessories also are exchanged on a flat-rate basis. —AVIATION

Recovering Spent Acid—To convert spent acid from the sulphuric acid alkylation process to 98% strength acid, plants now decompose the spent acid, in a high-temperature furnace, into its components, the hydrocarbon content (6-10%) supplying fuel. The combustion gases, partially cooled, are cleared of acid mist by a Cottrell precipitator, dried and contact-processed to pure acid. Overall efficiency is 93%. —CHEM. & MET. ENGRG.

Hydrogen Weakens Washers—Investigations of lockwasher breakage reveal hydrogen embrittlement as a cause of failure, especially in those that have been plated. The hydrogen is absorbed in heat treating and acid pickling, as the result of corrosion, and during plating. The cure is removal of the hydrogen by baking. —PRODUCT ENGRG.

Quick Test for Trusses—In testing 80-ft. welded H-section trusses fabricated completely from rolled members, the Austin Co. obtained 144 individual strain readings in 2 minutes. Test loads were 60-ft. lengths of structural steel. Gages were small loops of 0.001-in. copper-nickel wire cemented to the steel. Strain in the member caused a decrease in diameter of gage wire, the corresponding change in resistance being amplified electronically. —ENGRG. NEWS-RECORD

Stranded Springs—First observed in Russian machine guns during the Spanish Civil War, stranded helical springs have inherent damping useful in mechanisms operating at high velocity. Three-strands of music wire with a length-of-lay to strand-diameter ratio of 5 or 5.5 are best. —PRODUCT ENGRG.

Visual Selling—An album of story-telling photographs is part of the sales equipment of H. N. Crowder Jr. Co. Showing progressive steps in typical electrical jobs, the pictures attract attention, establish contacts, promote confidence, educate customers and justify time and charges. —ELECTRICAL CONTRACTING

Soil Reclamation Pays—Strip mine operators are finding that spoil is an asset rather than a liability. Reclamation by foresting brings an income of as much as $3.70 an acre; return on planting for heavy grazing is $7-8 an acre. The spoil can also be profitably prepared for hog-feeding, fruit-growing, fur-bearing animals, fishing and recreational activities. —COAL AGE

Silver Polished in Plating Bath—By reversing the current and using 4 times the amperage, silvered parts for electrical equipment are quickly electropolished in the electroplating bath at Westinghouse Research Labs. The silver removed is not wasted, but remains in the bath, extra handling is eliminated. —BUSINESS WEEK

Jetting Pipe Piles—To reinforce a transmission-line support in Colorado, 6-in. standard steel pipe piles were extended 30 ft. to solid foundation by alternate air and water jetting (both at 100 psi.) through 1¼-in. jet pipe. Filling concrete was then tremied into the pipes. —CONSTRUCTION METHODS

Box-office Television—To show the practicability of theater television, General Electric Co. relayed a program to a Schenectady playhouse by microwave radio and flashed it on a 11x15-ft. screen through a special Rauland Corp. projector. Microwave equipment had not been used before to transmit television for large-screen projection. —ELECTRICAL WORLD

Progress in Gas-Diesels

Dual-fuel engines, new system of supercharging and internal cooling, and electrical drive reported at oil and gas power conference

Improved Engines — In Nordberg's new dual-fuel, 4-cycle supercharged diesel, gas is admitted to the cylinders through a cam-operated valve timed to open after scavenging is completed and to close with the air-inlet valve. Adjustment of a gas-supply valve proportions gas and diesel fuel, and closing or failure of the valve automatically switches the engine to oil, without interruption. Control is so designed that the engine uses the gas available and diesel fuel to make up the deficiency; pilot fuel may be supplied by separate pumps through small nozzles. The supercharging system is intercooled, and tests with 90° F. manifold temperature showed a 40% thermal efficiency at 140 bmep.

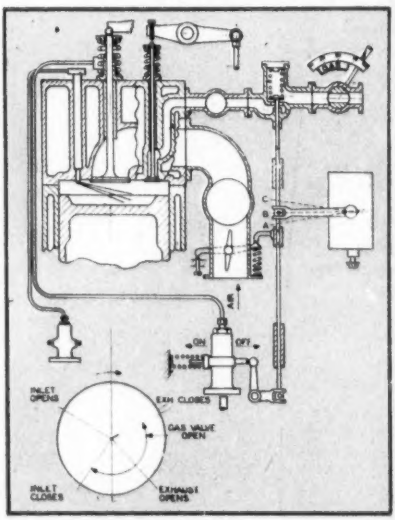
The low light-load efficiency characteristic of the low-pressure gas diesel may be caused by a too-lean mixture, and controlling the turbocharger so as to operate at lower manifold pressure might reduce fuel consumption at light loads.

Another new diesel design has been developed by Chicago Pneumatic Tool Co., this engine compressing a gas-oil mixture to diesel pressure levels, with ignition by injected pilot oil. During the first half of governor travel, the oil rate is held to that for pilot ignition, while the gas-control valve moves from closed to wide open. A spring-loaded control-rack stop gives pilot-fuel rate adjustment, and a gas-pressure regulator is set so that, at about 110% full load, any additional load will be carried by fuel oil.

A fuel consumption of 7,500 Btu. per bhphr. was attained with 10% pilot fuel at full load.

New Supercharger—In testing a new supercharging system, Nordberg found that reducing the temperature of the charge before compression is far more effective in increasing engine output than raising pressure. Intercooling of supercharged engines is a step in the right direction, but is limited by the need for cold water to reach the desired low temperatures. In the dual-pressure supercharging cycle, internal cooling is produced by expansion of the charge from a high to a lower pressure.

The bmep. attainable (in percent of nonsupercharged rating) with 3 types of dual-pressure supercharging is: (1) 140% without intercooling between blower and inlet manifold and with compression pressures limited to those in a nonsupercharged engine; (2) 175% with intercooling to give minimum permissible



In this 4-cycle supercharged gas-diesel, gas is admitted directly into cylinder; cam-operated gas valve opens after scavenging, closes with air-inlet valve. Gas supply valve regulates gas-oil ratio.

initial compression temperature and combustion pressures limited to those in a nonsupercharged engine; (3) 200% with intercooling to give minimum permissible initial compression temperature and *ratio* of combustion to compression pressure the same as in a nonsupercharged engine.

By selecting high manifold pressures and large expansion ratios, minimum permissible compression temperature for operation under (2) and (3) may be obtained with manifold air temperatures as high as 200° F., which permits the use of engine cooling water in series through the air intercooler. With the dual-pressure cycle, the scavenging pressure is higher than the supercharging pressure, so that exhaust from a multiple-cylinder engine may be carried to the turbocharger in a single pipe without loss of scavenging efficiency.

Electrical Speed Reducer—Tests of the Bowes electrical speed-reducing drive on a Maritime Commission C1-MA-V6 vessel were reported by the Elliott Co. Efficiency was 94%, including excitation, and ship-vibration was noticeably less than with direct drive. This drive also saves weight and space, results in better fuel economy, makes power available for auxiliaries, and when the driven shaft is not operating, large amounts of power are available for cargo handling or other service.

The drive consists of 3 concentric members, 1 on the engine shaft, 1 on the driven shaft, 1 stationary, with no mechanical connection between engine and driven shafts. It may be considered as 2 separate units, a synchronous generator and a synchronous motor. —POWER

INCENTIVE FOR SPINNERS

To give better spinners a chance to produce more fabric and earn higher pay, each spinning frame may be equipped with an operator-adjusted, variable-speed drive. When humidity is right, a good spinner runs frames 500 to 800 rpm. faster than average spinner. Operators can thus be paid according to their abilities. Another feature of the drive is that it allows spindle-speed to be increased gradually, and adjusted for bobbin filling and doffing.—TEXTILE WORLD

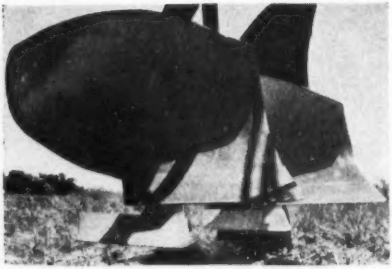
CHINESE TYPEWRITER—This new electro-automatic Chinese typewriter of International Business Machines Corp. was developed to relieve the drudgery of forming hand-painted characters. It contains a cylinder bearing 5,400 ideographs, is controlled by 43 keys arranged in 4 groups. Any character on the cylinder is brought into printing position and activated by striking 1 key in each group. Speed is 45 words per min. It takes about 4 months to attain top speed. —BUSINESS WEEK

HELICOPTER BUSES

Greyhound is experimentally operating a $48,500 Sikorsky helicopter in 25- to 100-mi. "air bus" service between major cities, using regular buses as "feeders." The company anticipates 12-passenger helicopters when it is ready to begin the service a few years hence. —BUSINESS WEEK

WASTE-PAPER MONEY

Savings amounting to $19,000 a year have been effected by mechanized waste-paper handling at the Dixie Cup Co. In addition, floor space is saved, plant efficiency improved, and the fire hazard reduced. All waste paper is disposed of immediately by conveyor belts and chutes, which transport it to collection and bailer area. There are sprinklers at the top and bottom of chutes and storage bins. Dump stations for collector bins are protected with fire flaps. —FACTORY



PLOW ENRICHES SOIL—In conventional plowing, a "furrow floor" is built up when the fine colloidal silt sifts down through the upper soil and forms a strata of gelatinous substance. To break up this floor, a plow developed by Oliver Corp. has small shares located below, behind, and slightly to one side of the main ones. Soil tilled with the plow is said to be enriched by the mixing action of the double shares. —PRODUCT ENGRG.

SAFE SULPHIDE ROASTER

For safe, effective roasting of arsenopyrite and other sulphide materials, a new research furnace has double walls of stainless steel, with asbestos cloth between. Commercial heating elements (1,800 watts) are used. Vacuum pulls enough air through for oxidation of the mechanically stirred ore, and is adjusted to prevent escape of poisonous fume. The products are drawn through a condenser into a woolen bag, and a water seal in the suction line prevents losses. High recovery of 90-99% As_2O_3 is obtained in this way.—ENGRG. & MINING JOURNAL

FLUORINE FOR SALE

Pennsylvania Salt Mfg. Co. has placed fluorine on the market in limited quantities at $20 per lb. for experimental use by manufacturers and research laboratories. Its availabilty is expected to speed development and increase use of new products such as anhydrous hydrofluoric acid, a catalyst used to produce aviation gasoline; uranium hexafluoride, employed in the separation of U-235; tetrafluoroethylene, the basis for the new Teflon plastic; a non-flammable, nontoxic organic fluoride with a high enough boiling point and specific gravity that it can replace mercury in the mercury vapor boiler; sulphur hexafluoride, said to be a nearly perfect insulator for high voltages used in X-ray and nuclear physics; a lubricating oil that assertedly will not break down; new insecticides; anaesthetics; solvents; and fireproofing materials. —BUSINESS WEEK

TURBO-GENERATOR PROGRESS

Setting records for size and steam temperature in the field of 3,600-rpm. machines, a generator under construction by General Electric Co. is rated 95,000 kw., and the turbine, a tandem-compound double-flow unit, will take steam at 1,000° F., 1,250 psi. It incorporates 19 high-pressure stages, 5 double-flow low-pressure stages. The last-stage wheel carries 23-in. long buckets of variable-angle, double-warped, airfoil section, will operate at maximum speed of 1,390 fps. There is no reheat, and 8 extraction points are provided. —ELECTRICAL WEST

CONDITIONED FACTORIES

In industrial buildings where light, temperature, humidity, noise, and ventilation are fully controlled, increased production, improved quality, and better labor relations result. A thorough preliminary study will determine whether the added cost of installation is economically justified. Comparing a controlled and a conventional plant of same floor area and clear working height, and with high concentration of machinery and employees: construction costs, 121:100; annual operating costs and fixed charges per sq. ft., 93¢:71¢; operating cost per man-hr., based on two 8-hr. shifts, 2.7¢:2.1¢. Complete artificial lighting provides uniform, no-glare illumination, allows more intensive use of floor space, and may be cheaper than a combination of daylight and artificial light controlled by photocells. Noise can be isolated and damped at its source, or absorbed by special surfaces. Ventilation can be better controlled. —ENGRG. NEWS-RECORD

Research or Retrench

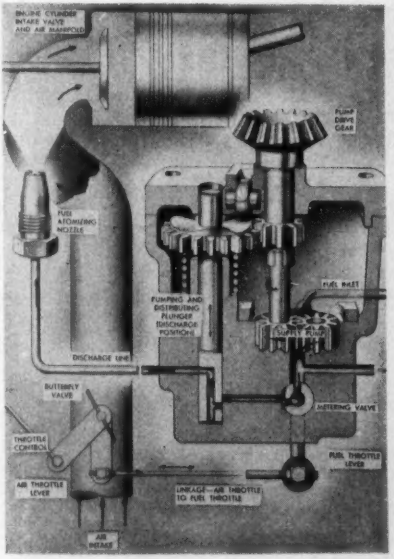
To keep pace with industry, large and small companies must improve and diversify their products. Research is an investment in the future

Technology represents opportunity to the company that takes full advantage of it, and is a threat to the one that doesn't. The rate of industrial change is accelerating, and the greatest need for research is not to raise profits but to preserve them. Attack is the best method of defense against technical obsolescence. The biggest gamble is to do no research.

Pattern—The coming era most likely will be characterized by a breaking down of barriers between technologies, and research must be prepared to investigate a wide variety of new materials and methods as they may relate to a company's products. A new technology (functional engineering) takes the customer's point of view and is placing increased emphasis on composite construction. Research must broaden the base of the business. Corporate earnings can no more be perpetuated without new products than family names can be perpetuated without children.

Program—Research projects should be analyzed on the basis of technical feasibility, economic soundness, sales prospects, production aspects, overall policy. Periodic appraisal and systematic reporting are essential. The program should be protected from sales-service encroachment or production trouble-shooting. Research directors must have wide abilities and must secure the cooperation of all departments. Experience has demonstrated the effectiveness of pilot-plant operation and "pilot sales" for easing the way for a new product.

Budgeting — While some large companies spend 5 or 6% of gross sales annually on research, small companies must watch their research dollars very closely. They list their problems of material, design, and production, and deliberate on new products. Choosing their experimenter carefully, they then give him all possible facilities and encouragement. They are finding that many veterans, army-trained technicians, are good prospects for doing research. Much outside help, from colleges and universities, industrial suppliers, trade journals and associations, and government bulletins, can easily be obtained. Research has marked the beginning of growth of many a company. —CHEM & MET. ENGRG.



SMALL-PLANE FUEL INJECTOR—For airplane engines up to 250 hp., Ex-Cell-O Corp.'s direct injection system atomizes a metered quantity of fuel into the air supply immediately ahead of the intake valve for better performance, greater safety, and less maintenance than with a carburetor. The metering valve following the gas supply gear-pump is controlled by linkage to the air throttle. A cam actuated plunger forces the fuel through the spray nozzle at timed intervals. —AVIATION NEWS

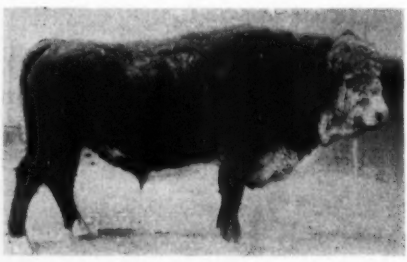
152-TOOL MACHINE LOWERS MASS PRODUCTION COST

Production costs can be reduced on parts requiring many machining operations by a line of machine tools connected by automatic conveyors. The machines are operated on a predetermined work cycle by built-in sequence timing. This promises to become a major trend in mass production.

Equipment of this type built by Greenlee Bros. & Co. is designed to produce 188 cast iron refrigerator compressor bodies per hr. at 80% efficiency. Two bodies are loaded on a single work-holding fixture and duplicate operations performed simultaneously. The 98-ft. 8½-in. machine mills, drills, bores, reams, chamfers, and taps in prearranged sequence. It has 24 stations, performs 31 different operations on each part, includes 50 drills, 12 face mills, 2 side mills, 2 end mills, 12 boring tools, 38 chamfering tools, 36 taps—a total of 152 tools. The operating cycle is 30.5 sec. —AMERICAN MACHINIST

INCANDESCENTS PREFERRED

Three comparative tests run on standard streets and highways show that fluorescent lighting is at a considerable economic disadvantage in comparison with filament-lamp lighting. Fluorescent units demonstrated the advantages of high efficiency of light generation, low brightness, relatively long life and enhanced visibility on wet pavements, but were outweighed by the disadvantages of low light output per foot of source, large size of luminaire, and need for jacketing in cold weather. —ELECTRICAL WEST



CATTALO OR BUFFATTLE—In 25 years of effort to obtain hardy cattle for Canada's subzero winters, breeders produced offspring such as this by crossing buffalo cows with Aberdeen, Angus, Shorthorn, and Hereford stock. Some 75 calves were born this year. —FOOD INDUSTRIES

SO_2 PROCESS FOR MANGANESE GOOD BUT EXPENSIVE

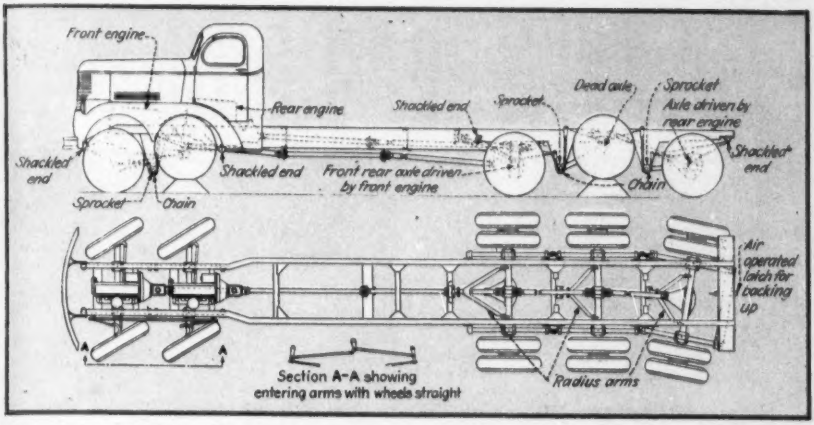
Following thorough study of all available methods of producing high-grade manganese oxide, Manganese Ore Co. demonstrated that the sulphur dioxide process will give manganese nodules from low-grade domestic ores, on a large scale but at a noncompetitive price. In test work, the process was found applicable to a great variety of ores, and should produce about 200 long tons of nodules daily at a processing cost between $0.50 and $0.60 per ton. —ENGRG. & MINING JOURNAL

RESISTANCE IN REVERSE —A USEFUL NEW DEVICE

Used as the sensitive element in the Army-Navy bolometer, which can detect a man ¼ mi. away at night by the heat of his body, the thermistor has many important commercial applications. It is a metallic oxide semiconductor which passes more electrical current when hot, less when cold, and halves its resistance with a 20° increase (it takes 300° to double copper's resistance).

A speck of semiconductor, sealed in a glass bead hardly bigger than a pinhead, is used in automatic gain controls for long-distance telephone amplifiers. As power increases, it heats up, passes more current to an electronic valve which reduces amplification, and vice versa.

Thermistors can be balanced with resistors in voltage regulators to give constant output from a varying source or under varying temperatures. They are employed extensively to supply a standard for measuring the power output of radar sets. In time delay circuits, they may be set anywhere from 1/10,000 sec. to more than 10 min. —BUSINESS WEEK



TWIN-ENGINE SUPER TRUCK—Designed for long hauls, the 20-ton-payload truck developed by Eisenhower Mfg. Co. has 2 engines, 4 front wheels, 6 dual rear wheels. One engine is under the hood, the other under the cab, each drives a separate rear axle (3rd axle is dead). When used together, the engines are balanced by a torque equalizer actuated by manifold pressure. The truck frame is rigid, and a very flexible suspension allows it to remain level over bumps. The front suspension consists of 2 axles, each supported by leaf springs. One end of each spring of a pair is shackled to the frame; the other ends are connected together by a chain passing around a sprocket attached to to the frame. Rear suspension is similar, but both ends of center rear axle springs are connected to chains. Rearmost axle can follow the steering wheels on turns, is locked in position for backing. —PRODUCT ENGRG.

HYDROGEN THYRATRONS HAVE MANY USES

New fast-deionizing 4C35 and 5C22 hydrogen thyratrons permit switching rates of as high as 5,000 per sec. for the line modulator circuit used in keying magnetrons, for pulsed communication systems, for replacing gaps in spark-type electronic heating units, and for high-speed welding. In this type of modulator, the pulse is formed directly at high voltage levels. A small artificial transmission line, consisting of recurrent *LC* networks, charges up between pulses to a very high voltage. And each time the recurrent electronic switch, or thyratron, closes, the line releases the stored charge in a surge through the load.

The hydrogen thyratron is adaptable to several industrial applications where the light weight, simplicity, flexibility, ease of operation, high voltage and current, and rapid switching will be of value.

The 5C22 has been operated 1,000 to 5,000 times a sec. using 8 kilovolts and 75-amp. peak current, the 4C35 has functioned at frequencies over 100,000 cps. at low voltages, currents.—ELECTRONICS

NEW WAY TO LEAKPROOF DEEP TRENCHES

To prevent both through-seepage and under-seepage in earth levees and dams, a new method of sealing a deep cutoff trench with clay slurry and back filling it with puddled clay has proved effective. No sloughing of the wall occurred during the simultaneous excavation, slurry-filling, and backfilling of the trench, which was dug to a 35-ft. depth with trenching machine and dragline. The impervious cutoff trench required no special materials, is not subject to rupture through settlement or deterioration, and is self-adjusting and self-healing. Shortcomings: limit in depth, and relatively high cost.—ENGRG. NEWS-RECORD

NEW PRODUCTS

Welding Current Controls Engine—A gasoline engine driving a welding generator is automatically slowed to idling speed, 12 to 15 sec. after the operator stops welding, with a device developed by Hobart Bros. Co. To bring the engine to normal speed, the operator merely strikes the arc, the flow of current actuating the control. Purpose is to save gasoline, prolong engine life. —POWER

Dip Dye for Plastics—Thermoplastics can be dyed at room temperatures with a dip solution developed by International Printing Ink. The color is said to become integral with the piece. —BUSINESS WEEK

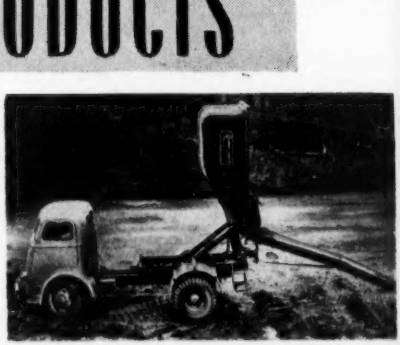
Sanitizing Agent—Giving a detergent action at high or low temperatures, a new nonirritating, nontoxic disinfectant of Sethness Products Co. is particularly applicable in food processing and bottling plants. At 1 to 5,000 dilution, 99.5% kill of bacteria is obtained in 1 min. or less. It is harmless to users, clothing, metals. —FOOD INDUSTRIES

Cushioning Idler—Installed at loading points, the new troughing-idler of Chain Belt Co. reduces belt wear due to impact of material. Idler rolls are rubber cylinders vulcanized directly to assembly tube. Molded into each cylinder are multiple grooves, both deep and shallow, to guard against belt rupture, cover laceration. —ENGRG. & MINING JOURNAL

Anticorrosion Coating—Developed to protect equipment and floors against fumes or spillage of acids or alkalis, Acid-Causticbond is made in several colors by Wilbur & Williams Co. —FACTORY

Fan and Grille Heater—Built in behind the electric heating element of a grilled wall-heater of Thermador Electrical Mfg. Co. is a turbine-type 16-blade fan driven by a 4-pole induction motor. The grillework deflects the warm air to the floor. Unit can be used for air-cooling. —ELECTRICAL CONTRACTING

Robot Shaft Balancer—30 Plymouth crankshafts are dynamically balanced per hour with a new Gisholt Machine Co. 2-element unit. The balancer has a weighing dial for each of 6 points on the shaft ends at which metal is to be removed. As each dial is set in sequence to a zero meter reading, selsyn motors adjust a cam on a corresponding spindle of a multiple drill. This cam actuates a gage which controls the hole depth to an accuracy of 0.003 in. Checking is unnecessary. —AMERICAN MACHINIST



CONCRETE HANDLER—For transporting and discharging air-entrained concrete, this all-welded high-tensile-steel handler of Maxson Construction Co. has an adjustable baffle, deflector plates, and inverted center keel, providing a discharge (as high as 6 ft. 3 in. above ground) similar to that of a bottom-dump bucket. Rated capacities of 2 models, 2 and 4 cu. yd. —ENGRG. NEWS-RECORD

Flexible Glass Ducts—Made of glass and asbestos fabrics impregnated with synthetic rubber and plastics, U. S. Rubber Co.'s round and rectangular Multi-Flex ducts are light, durable, and designed for temperatures of 350° to —70° F. Flexibility is obtained by corrugations. —PRODUCT ENGRG.

Bubbleless Oil—Gulf Oil Corp.'s new antifoam agent reduces the tendency of lubricating oil to form bubbles under the churning action of crankshafts. It reduces the surface tension. —POWER

Fountain Pen Brush—No larger than an ordinary pen, a pocket fountain brush of Cushman & Denison Mfg. Co. will sketch or mark on any surface, wet or dry. A valve control permits light or heavy flow of marking color. —SCIENCE ILLUSTRATED

Family-size Pasteurizer—Operating on 110-volt, 60-cycle power, a home milk pasteurizer developed by Guard-It Mfg. Co. has an electrical heater, a motor-driven agitator, automatic time and temp. control. It is designed for rural use. —ELECTRICAL WORLD

Spiral Sawblade—Made of oil-tempered spring steel, and designed for hand-coping or power-jigsaw cutting of all woods, light metals, and plastics, a circular-section blade of Tyler Mfg. Co. eliminates the turning of saw frame or work. Normal stock removal in one stationary stroke leaves a perfect circle in the piece. —CONSTRUCTION METHODS

Makes Batteries Last—Tests indicate that thin glass fiber mats increase acid storage battery life as much as 50% when used to enclose the positive plates. They hold migrant granular lead particles in their facial interstices, from which they are restored onto the plate surface by charging. Otherwise, the particles would drop into the sediment chambers. These new Johns-Manville Corp. retainers are lightly impregnated with oven-cured phenolic resin. —ELECTRICAL WORLD

Transparent Twin Strainer—Made of transparent Lucite, the casing of the new 2-basket pipeline strainer of J. A. Zurn Mfg. Co. permits visible inspection of the strainer screen. If cleaning is necessary, flow can be diverted to second basket while fouled screen is removed, cleaned. —ENGRG. & MINING JOURNAL

No-drip Faucets—The valve closes in the direction of flow in Crane Co.'s new water faucet, the pressure helping to prevent leakage. —BUSINESS WEEK

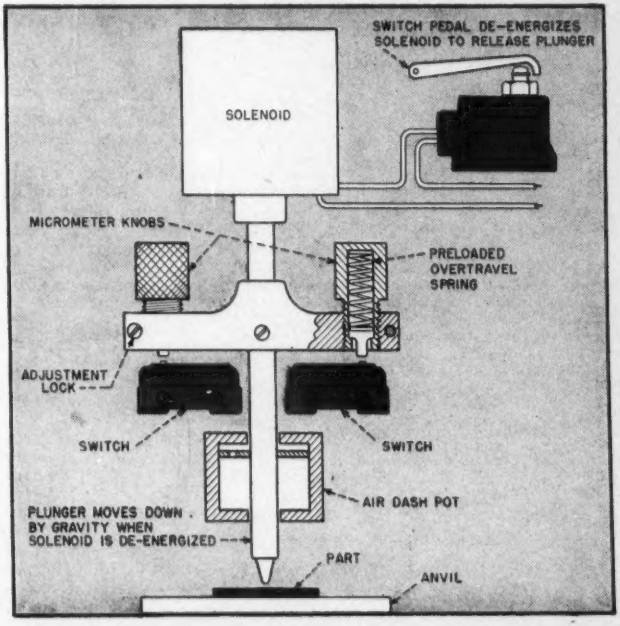
Wet-proof, Nonslip Gloves—Canvas work gloves impregnated with tough, oil-, acid-resistant, milled neoprene for protection on very wet jobs have been introduced by Pioneer Rubber Co. A rough surface gives a nonslip grip. —MILL SUPPLIES

Printing-press Time Saver—Equipped with a steel scale and an overhead ground-glass viewing instrument, the new Opti-Check stand of H. H. Heinrich, Inc., can be used to register multi-color plates accurately on printing-press cylinders. While the press is running on one job, an extra set of cylinders is readied for the next run to curtail make-ready and idle press time. —BUSINESS WEEK

Child-proof Toys—Unless junior has a flame-cutting outfit, he can't wreck the welded-steel-frame hobby horse, teeter-totter, and walker made by Houck Bros. Production costs are low, too, for comparatively small quantities, and the jigs and fixtures required are relatively simple and inexpensive. Rough spots are removed by a motor-driven grinder. —WELDING ENGINEER

Deep-draw Plastic—A thermoplastic sheet material (48x48 in.) which can be deep drawn with low pressure has been introduced by Hercules Powder Co. Laminated with cellulose plastics, the sheets can be produced in any color. —PRODUCT ENGRG.

Strength Multiplier—One man can raise and shift a 5-ton machine with a new Arnolt Motor Co. lifting bar equipped with a roller for extra leverage and movability. —POWER



SNAP-SWITCH GAGING—Speed and precise repeatability have been attained with snap-acting electric switches in "go" and "no-go" gaging. Maximum variation is ±0.00075 to 0.001 in.; special switches are more precise. When the solenoid of this gage is de-energized, the plunger moves down, and both switches snap and flash lamps if piece is too thin, one snaps if piece is correct, neither snaps if it is too thick. The gage can be arranged to record number passed and rejected and to move inspected pieces by air blasts into proper trays. Made by General Control Co., it can check 3,600 pieces per hr.—AMERICAN MACHINIST

NEW PRODUCTS

Speeds Production — Self-leveling material racks which bring each piece to the operator's hand level are an innovation by American Machine & Foundry Co. Spring powered, the racks move up out of a cabinet at worker's left, similar racks move down, when filled, at the right. —AMERICAN MACHINIST

Inspection at a Glance—Side, back and top of a product part can be viewed at one time by an adjustable-hinged, duplex mirror of Van Wagner Co. —FACTORY

Paper Baking Pan—Combining laminated protective papers and leakproof folds, a baking pan of Basic Food Materials, Inc., withstands the heat of baking and affords protection against moisture and grease penetration. A holder is supplied with the paper pan. —FOOD INDUSTRIES

Flexible Plastic Molds—To be used in molds for plastic parts, the rubber-like Duroflex plastic can be stretched to remove castings and used again. It is made by Duorite Plastic Industries. —AMERICAN MACHINIST

Pitch-protected Sheet Metal—Corrugated or V-crimp steel-metal siding or roofing sheets are protected against rusting or corrosion by salt air or chemical fumes with a Plastipitch coating developed by Koppers Co. The sheets may be bent without damaging the coating. —POWER

12-million-lumen Flasher—For use as a beacon, an obstruction or airport-boundary marker, or similar signalling applications, a new xenon gas-discharge tube provides 1/5,000-sec. flashes of 12,000,000-lumen peak intensity. It operates from a condenser-discharge circuit. Sylvania Electric Products is the maker. —ELECTRICAL WORLD

Toy Tools for Layout—350 master planning templets and 3-dimensional templet-base models of machine tools scaled ¼ in. to the ft. have been introduced by Visual Production Planning, Inc. —FACTORY

FOR MORE INFORMATION

Inquiries will be welcomed from readers who desire additional facts about any of the items in this issue.

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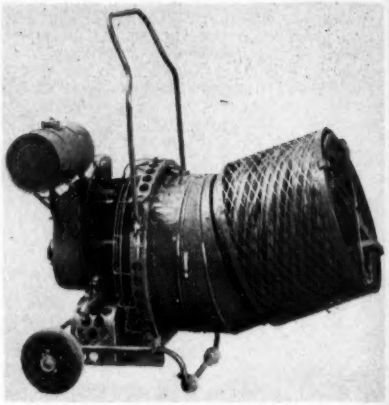


VENTILATOR ON WHEELS—For cooling machinery and hot spaces, this self-powered 87-lb. unit delivers up to 4,500 cfm. of air. It has a high-capacity gasoline-powered fan and a removable cage containing 16 ft. of 14-in. dia. collapsible air duct. The ventilator is a Herman Nelson Corp. product. —CONSTRUCTION METHODS

Insomnia Music—For people who can't sleep, De Luxe Record Co. is making a $5.25 phonograph record that is supposed to overcome insomnia. —BUSINESS WEEK

Evaporative Cooler—In a 24x24x28-in. cooler of Palmer Mfg. Corp., a 14-in. fan draws air at 1,250 cfm. through replaceable Arizona aspen pads. A dripper feeds water evenly across pad. Unit has 1/30-h.p. motor, and 3-point suspension saves installation time and cost. —ELECTRICAL MERCHANDISING

Electronic Stethoscope—Heart sounds can be amplified and other body sounds subdued for more accurate diagnosis with Maico Co.'s new 3-lb. Stethetron. —BUSINESS WEEK

Dual-purpose Machine—Motor Generator Corp.'s new combination battery-charger arc-welder has separate control panels for each battery circuit, one for the welding circuit, and can be switched easily from one operation to the other. —POWER

Fan Keeps Flies Away—Flies and mosquitoes cannot pass through the 3-ft.-wide downward stream of air produced in doorways by Reynolds Electric Co.'s new fan. The unit, having propellers 20-in. dia., is said also to protect food counters. —FACTORY

Elastic-impeller Pump—A small paddle pump with an elastic impeller that will operate up to 1,750 rpm. has been introduced by Jerome Simer Co. —AMERICAN MACHINIST

Rub-on Auto Paint—Applied with a piece of cheesecloth, a new DAB paint of Motel Supplies gives a factory-like finish to any automobile. In 1 hr. one man applied a complete coat to a 5-passenger sedan, using 1 quart ($6). Sold in 4 standard colors, it is guaranteed for 2 yr. —BUS TRANSPORTATION

Uncanny Accuracy—Thickness of any material—hard or soft, conducting or nonconducting—can be measured as close as 0.00025 in. with the new electronic micrometer of Carson Micrometer Corp. A special circuit indicates precise instant of contact between screw and work, before there is any compression. No current is interrupted at the contacts. —BUSINESS WEEK

Adjustable Light Fixture—Base and receptacle of a new electric fixture hanger remain stationary, but hanger arms may be turned to any horizontal angle to fit a lighting plan. This hanger is furnished by Simplet Electric Co. —ELECTRICAL CONTRACTING

Illuminated Magnifier—Combining magnification with illumination in single unit, the Haas Corp. is offering floor and table models of a product that eliminates, in first-aid and hospital rooms, supplementary lighting and lenses. A floating arm supports lens and 2 fluorescent tubes. —FACTORY

Two-way Iron—Designed to be tipped on its side when not in use, the new dial-adjusted electric hand iron of General Mills, Inc., is rounded at the back and has a tapered sole plate for operation in any direction, under buttons and into tucks. The side rest reduces possibility of tipping. —BUSINESS WEEK

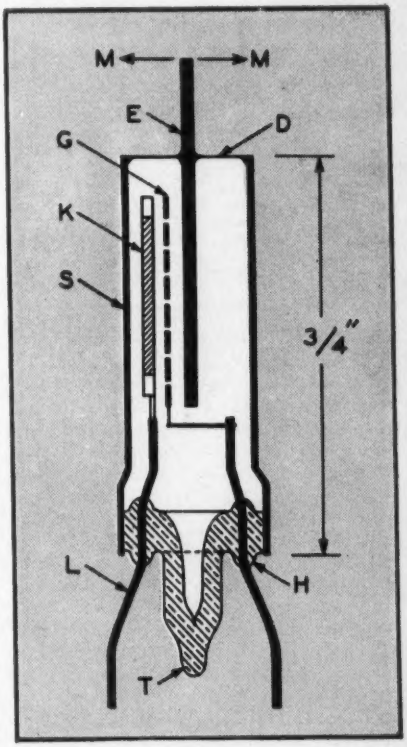
Shaft Reamer—A reaming bit, 20 ft. long and 7 ft. in dia., drills vertical mine shafts 228 ft. through saturated and unconsolidated material. Cutting edges of the 7,000-lb. unit are Stellite. Hollow center shaft carries drilling fluid to cutting head and projects ahead of reamer. —CONSTRUCTION METHODS

Freshens Refrigerators—Absorbing refrigerator odors and eliminating food waste, an aluminum odor filter of the Presco Co. is designed for refrigerators up to 12 cu. ft. capacity. —ELECTRICAL MERCHANDISING

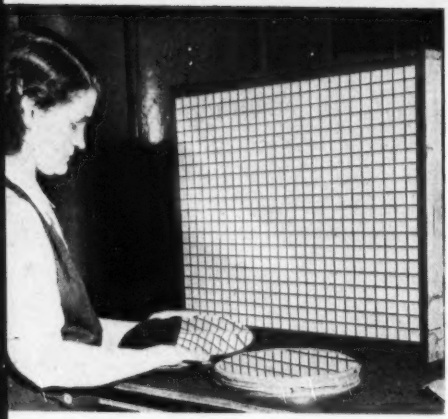
Holds Paint On—Known as Hold-Tite, a product of Gillespie Varnish Co. removes wax and grease and prepares glossy surfaces for coating. Added to new paint in ratio 1:8, the mixture is held more permanently to old finishes. —FACTORY

Fuel-saving Oil Burner—10.9 to 24.5% less fuel is said to be used with the new Gilbert & Barker Mfg. Co. oil burner because the air fan reaches full speed before a centrifugal clutch applies power to the fuel pump, insuring enough air for complete combustion on start-up. —BUSINESS WEEK

Integral-motor Lathe—Instead of gears or belts, the headstock of a new 13-in. Motor-Head Rapid Production lathe has a motor rotor pressed onto the spindle and the stator bolted to the housing. The tool is for light, high-speed cutting. — MERICAN MACHINIST



VIBRATION MODULATES TUBE—Mechanical motion is converted directly into variable electron flow by a new 1/15-oz. triode vacuum tube developed by RCA. This Vibrotron will find wide application in phonograph pickups, and it can be used in microphones and industrial measurement and control circuits. It operates as an integral part of the pickup head and radio phonograph amplifier without a preamplifier or coupling transformer. Motion of the movable anode (E) in direction (M-M) is transferred through the thin metal diaphragm (D) to produce a proportional change in electron flow of the triode formed by (K), (G), and (E). Envelope (S) is metal and leads such as (L) are brought out through the glass header (H) with exhaust tip (T). —ELECTRONICS



MIRRORGRAPH INSPECTION—Polished recording disk bases mirror their own defects at the plant of Audio Devices. The reflected ruled lines of the vertical board are straight (right) when the disk is perfect, wavy (left) when the surface is uneven. —BUSINESS WEEK

NEW INGREDIENT IN CANDY

Oil-seed, cereal, and legume products, ground to pass a 200- or 300-mesh screen, were incorporated into candies in recent investigations, thereby increasing the carbohydrate, fat, mineral and vitamin content. From 4 to 7% of pulverized products from wheat, cottonseed, soybeans, and peanuts did not change the usual characteristics of nougat, caramel and fudge. Dispersion of the ingredients in fat or in cold sugar sirup gave uniform distribution and prevented balling or scorching in the cooking process. Assays showed that thiamin and riboflavin were well retained in candies for 180 days at 74-80° F. and 55% relative humidity. —FOOD INDUSTRIES

DIVERSITY IN HOSE

Knitters can easily be trained to operate 30 to 36 of the 400-needle circular machines recently installed by a textile mill to secure styling facility and versatility in producing seamless hosiery. Flexibility in job assignments for operators will also be obtained. On a 12-pair basis, the textile mill estimated that seamless hose were $1 less expensive to manufacture than were the full-fashioned hose. —TEXTILE WORLD

ELECTROPOLISHING, A CONVENIENT PROCESS

Really electroplating in reverse, electropolishing is replacing machines for finishing metal articles to a brilliant, mirror-like surface, for machining parts to size, removing burrs, and preparing surfaces for electroplating, painting, lacquering, japanning, and anodizing. The part to be polished becomes an anode instead of a cathode, as in electroplating, and when current is applied a minute film is removed from the surface.

Electrolytes of sulphuric and phosphoric acids are suitable for electropolishing many common metals and alloys—mild steel, high-carbon steel, low-alloy steel, austenitic stainless steel, ferritic stainless, aluminum, and brass—under the same processing. Stainless steels are electropolished in solutions comprising 50-60% citric acid, 15-20% sulphuric acid, and water.

An excellent application for electropolishing is costume jewelry, for which the cost may be only ½¢ a part. Brass parts of intricate design can be polished and coated with a thin flash of gold. A pebble finish is obtained at low cost by electropolishing after preparing the surface by shot blasting, sandblasting, or vaporblasting. The polish may be varied from a Butler finish, as found on quality silverware, to a sparkling finish. Such a finishing procedure has the practical advantage of hiding die marks introduced in processing or fingermarks or scratches incurred in service. A two-tone effect is attained by masking certain areas during the abrasive operation before polishing. Design effects, such as a relief pattern, are attained by selective electropolishing of a surface having a "stop-off" applied in the form of a design.

With an equipment investment of $16,000 to $20,000, stainless steel, welded wire shelves, 18 x 28 in., can be electropolished at a rate of 200 per hr. and an estimated production cost of less than 4¢ a piece. —PRODUCT ENGRG.

Why Radiant Heating

By heating floors and other cool surfaces, rather than air, working and operating conditions in factories are being improved in surprising ways

Although the original objective was employee comfort, new benefits of radiant heating are being obtained in manufacturing areas.

Installations—Boilers, controls and valves are the same as for conventional heating. Runs of 1-in. pipe, either in serpentine or grid layout, are embedded in the concrete floor slab and water at about 140° F. flows through the system. The floor will be about 85° F. This design does not prevent factories equipped with steam boilers from using radiant heat. Most factory buildings are "zoned," each zone having its separately controlled heating panel. Occasionally the pipes are embedded in concrete ceiling, walls or roof.

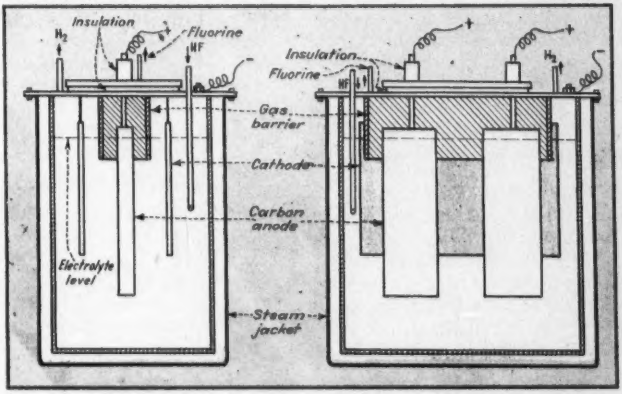
Comfort—With the temperature controlled, there is no stratification of heat—less than ½° difference between 6 in. above the floor and 22 ft. above it. Employees near windows are just as comfortable as others. Washrooms, changing rooms and medical departments can be kept at even, healthy temperatures. Opening large shipping doors does not materially affect the conditions, and reports indicate that workmen are free from colds, rheumatic pains, and influenza. The atmosphere is usually invigorating, being 5-10° cooler.

Cleanliness—Radiant heat passes through the air without disturbing it mechanically, and this elimination of convection currents keeps dust and dirt down and removes the severe lint conditions found in textile mills. Fog and condensation, frequent sources of dirt accumulation in high-humidity factories, do not occur in radiant heated areas.

Economy—Since they are concealed in the floor, radiant heating systems do not interfere with revisions in production line layout or with the relocation of manufacturing equipment. Lower temperatures needed for storage areas and unused spaces can be obtained by a balance valve.

In one plant with 6,000 sq. ft. of floor space and large areas of glass on all sides of the building, only 95 tons of coal were consumed from September to May.

—FACTORY



PRODUCES FLUORINE—Producing several pounds of fluorine a day, this welded steel, airtight electrolytic cell contains anhydrous hydrofluoric acid (40%) in fused potassium bifluoride. Steam-heated to begin electrolysis, the cell must then be water cooled to 95°. Anhydrous HF is added. Polarization is overcome by temporary substitution of nickel for carbon anode—CHEM. & MET. ENGRG.

POWER MOWER—Balanced for easy control, a new 30-in. power lawn mower features 2 sets of 4 shatter-proof steel, double-edged, horizontally rotating cutting blades. Automatic clutch disengages drive when handle is released. Handle is collapsible. —ELECTRICAL MERCHANDISING

AC POWER FOR PLANES WITH EXCITER-REGULATOR

It is generally recognized that ac. power is preferable on large aircraft with several electrical auxiliaries. For this service, there has been developed a self-excited ac. system employing an electronic exciter controlled by an electronic voltage regulator. One variation of this system is for 3-phase, 400-cycle, constant-frequency, main power supply. A second is for single-phase, variable-frequency, 380 to 1,000-cycle auxiliary power.

Weight of alternator is about 25% less; commutation problems at high altitudes are eliminated; mechanical design of the alternator is simplified; the simplified alternator may be operated at higher speeds.

With special circuit design, voltage collapse under certain short-circuit conditions is overcome on faults with enough impedance to maintain about 35% of rated voltgage. —ELECTRONICS

BULLDOZER HOPPERS SPREAD BLIMP LANDING MATS

In constructing 450,000 sq. yd. of rigid base for landing mats serving blimps, soil-cement mix was produced at 180 tons per hr. in 2 pug mill plants. The mixture (pit-run sand gravel high in clay content, and 3 sacks per cu. yd. of 8% water portland cement) was spread alternately in 20-ft. lanes by pusher-hoppers built up on bulldozer attachments on the front of crawler-tractors. After compaction by 10-ton rollers, emulsified asphalt was applied to the moistened surface, and a wearing surface of 1½-in. cold-mixed asphaltic concrete completed the job. Tests showed the 6-in. soil-cement base to be equal in compressive strength to 2,500-lb. concrete. —CONSTRUCTION METHODS

TWO-MILLION MILE BUS?

Seen as a possibility of the future is a bus that will run 2,000,000 miles. Almost every bus company already has equipment that has traveled in excess of 1,000,000 miles, and many diesel buses have operated in excess of 1,300,000 miles.

Twin Coach Co. is building a bus with two 180-hp. engines which can deliver a total of 300 hp. at 60 mph. and 2,000-2,100 rpm., a relatively low engine speed that will contribute to longer engine life. The two engines also will give passenger-car performance on hills so as not to impede traffic. —BUS TRANSPORTATION

POWER FOR CHINA

Steam-electric power generating stations totalling 50 kw. in 10 standard units will be installed in 7 plants in China at a cost of $6 to $9 million. One probably will be located in Siam, several in or near Hankow, at least one in Shanghai. Delivery is expected in 12 to 14 months, to be followed by more units later as part of present program. —ELECTRICAL WORLD

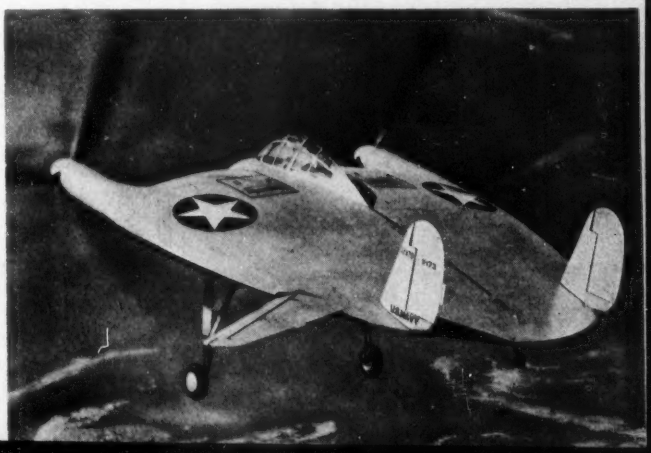
What's New in Aircraft

Unconventional design features are incorporated in several of the recently developed private and commercial planes

Two engines will be geared to each propeller in the 4-engine Beech Aircraft Model 34 advanced 20-passenger feeder-airline plane, giving it the appearance of a conventional 2-engine ship. The 350-hp. engines will be arranged in tandem and entirely within the wings. This *Twin Quad* will have a "butterfly" tail and carry pickup equipment. With the new Hamilton Standard "baby" Hydromatic propellers (10 ft. 7 in.), the plane will cruise at 182 mph. on 60% power at 4,000 ft., will land in 2,100 ft. over a 50-ft. obstacle and take off in 1,980 ft. . . . A radically designed 2-place pusher monoplane has been test flown by Consolidated-Vultee Aircraft Corp. It is a low-wing cabin model with the 80-hp. engine buried in the fuselage, power being shafted from the engine to a 3-blade propeller behind the single-fin rudder. . . . Variable-incidence wings have proved successful and will be a feature of a new British amphibian. Pivoting on the front spar, the wing will tilt at varying angles of attack through a range of 15°, for a very high lift coefficient. A screw-jack mechanism on rear spar changes the angle. . . . To sell in the $3,500-$4,000 price bracket, the Rawdon Bros. Aircraft Co.'s new low-wing, tandem, 2-place monoplane will clear a 50-ft. obstacle in a 400- to 425-ft. take-off run and climb 30°. Wings are plywood and spruce monospar design; engine, a 125-hp. Lycoming; cruising speed, 115 mph. —AVIATION NEWS

To carry 10 passengers or a 1-ton load, a 11,600-lb. two-rotor helicopter with two 550-hp. engines is being built by Kellett Aircraft. To cruise at 90 mph., it is designed for hauls between midcity areas and airports. —BUSINESS WEEK

Designed as a luxury cross-country personal airplane, Funk Aircraft Co.'s new F2B is powered by an 85-hp. Continental C-85, cruises at 100 mph. It takes off in 350 ft., climbs 800 fpm., has a 350-mile range . . . Resembling the XB-42 Mixmaster, the Douglas XB-43 is powered by 2 G. E. TG-180 axial-flow turbines of 4,000-lb. thrust each, completely buried in the fuselage. It has a span of 71 ft. 2 in., is 51 ft. 6 in.



HOVERS LIKE HELICOPTER—Just revealed by the Navy and Chance Vought, the astonishing XF5U-1 is a conventionally powered airplane which can hover like a helicopter. Consisting of a "round" wing with tractor propellers at the outer edges, the "Flying Pancake" promises to rival the flying wing in efficiency and the helicopter in utility. With gas-turbine engines, its speed range varies from 0 to 550 mph. When the plane is nose up, the propeller blade flattens out as it sweeps aft, as does a helicopter rotor.—AVIATION NEWS

long, is expected to fly faster than 500 mph. . . . Now being assembled for test flight, Howard Hughes' giant H-4 all-wood 400,000-lb. (gross) flying boat will be powered by 8 Pratt and Whitney Wasp Majors of 3,500 hp. each. —AVIATION

HUMAN ENGINEERING

Nothing is more important to an executive than human engineering. A chemical engineer sees it this way: "I had been in the business of engineering 30 years before I began to discover that people are more important than things. I am just now discovering that a successful executive chemical engineer, for example, need not be a very smart chemist, but he must be smart about collecting smart chemists around himself and keeping them happy."—"Developing Your Executive Ability," McGraw-Hill Book Co.

CANADA'S INDUSTRY EXPANDS

Private industry in Canada plans to spend $1,200 millions in 1946 on new construction and equipment, a Dept. of Reconstruction survey reveals. Expenditures planned by major industries are: manufacturing, $400 millions; mining, $25 millions; lumbering, $10 millions; transportation, $140 millions; public utilities, $125 millions. —AMERICAN MACHINIST

ACETYLENE DEVELOPMENTS

Besides the usual carbide method for obtaining acetylene, war-time Germany used an electric-arc cracking of methane-ethane mixtures obtained from coal hydrogenation or from natural gas. Ethylene was produced by catalytic hydrogenation of acetylene over palladium on silica gel at 200 deg. C. using 100% excess hydrogen; also by dehydrating ethanol over oxide catalysts. In manufacturing styrene, benzene was ethylated in a jacketed vertical glass-lined reacter at 95 deg. C. in presence of aluminum chloride.

In perfecting processes for vinyl compounds, it was found possible to insert acetylene between H and O, S, N, or COO groups; and to attach a vinyl group in the ring of phenol to produce polymers.

A method also was developed for inserting acetylene into various organic compounds, using copper or silver acetylide catalyst, making a carbon-carbon bond, and leaving the product with a triple bond. Germany based a series of processes on the introduction of carbon monoxide into an organic molecule by making a carbon-carbon bond using a nickel carbonyl catalyst. Another research development was the production of a mixed aldol of acetaldehyde and propionaldehyde, which upon hydrogenation and dehydration yielded isoprene. —CHEM. & MET. ENGRG.

MAGNESIUM TRUCK BODIES

Using structural shapes of light-weight magnesium alloy, truck-body weight has been reduced as much as 1,500 lb. without loss of strength or durability. Through careful design, existing weak points on steel units, especially floor beams, corner posts and roof shoulders, can be strengthened when converting to magnesium. —BUS TRANSPORTATION

CRUDE FATS FOR FINE SOAP

Bleaching with sodium chlorite, in conjunction with sulphuric acid or chlorine, makes crude fats suitable for use in producing high-grade soaps. Applied to refined tallow, house grease, and other crude fats, the process is carried out directly in the kettles used for fat purification. A batch of tallow bleaches in about 1½ hr., 2 lb. of chlorite per ton being required. Color improvement is said to be greater than with other treatments, odor is improved, yield of tallow stepped up. —BUSINESS WEEK

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UPHILL CONVEYOR—Lifting iron ore 272 ft. at an average rate of 550 tons per hr., this 946-ft. conveyor is made of cotton-cord 30 in. wide faced with synthetic rubber. A 200-hp. slip-ring motor drives the belt through a double V-belt reduction ratio of 27:1. Effective tension is 10,600 lb. Weight of belt: 11 lb. per ft. In 2 seasons of operation, production increased to an average of 7,500 long tons per 24 hr. Located in Minnesota, this system made low-cost mining possible. —ENGRG. & MINING JOURNAL

NEW-TYPE VACUUM TUBE—An electronic tube developed by Bell Telephone Laboratories can transmit and amplify 10,000 simultaneous cross-country telephone conversations. Its power gain is 10,000 times over an 800-megacycle band width, compared to a gain of 10 over 20-mc. for the present pentode tube. It has a long coil of thin wire the length of its stem. The wave to be amplified travels through the coil. A beam of electrons shot through the bore of the coil gives up energy to the wave, since it moves faster than the wave. Widespread application of the tube in long-distance telephony and television is expected by its developers. —BUSINESS WEEK

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